NATIONAL REGISTER TESTING OF 19 PREHISTORIC ARCHEOLOGICAL SITES AT FORT HOOD, TEXAS: THE 1995 SEASON

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NATIONAL REGISTER TESTING OF 19 PREHISTORIC ARCHEOLOGICAL SITES AT FORT HOOD, TEXAS: THE 1995 SEASON

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Archeological testing of 19 prehistoric sites on Fort Hood was conducted by Prewitt and Associates, Inc., to evaluate each site's eligibility for listing in the NRHP. Forty-one backhoe trenches and 75 units (1x1 m) were excavated from June through September 1995. The tested areas consist of 15 rockshelters, 6 open sites along the Leon River, and 4 other open sites. Based on the data obtained during the testing, it is recommended that 11 of the 19 sites (4 rockshelter sites, 4 Leon River sites, and 3 other open sites) be considered eligible for listing in the NRHP.

Within the 19 tested sites, 35 analysis units were defined. Almost all of the occupational episodes represented by the 35 units occurred during the Late Archaic and Late Prehistoric (both Austin and Toyah phases) periods. All but one of the tested rockshelters were occupied primarily during the Late Archaic and/or Late Prehistoric periods. Evidence of recent disturbance by vandalism was observed in most of the tested shelters, and some shelters have had their deposits severely disturbed or totally destroyed (e.g., Shelter A at 41BL69). Evidence of intensive terminal Archaic and Austin phase into Toyah phase activities was found at four Leon River sites (41CV1478, 41CV1479, 41CV1480, and 41CV1482). Single or stratified occupation zones at these sites are buried within the Leon River paleosol. Investigations at other open campsites provide evidence of moderate to intensive occupations along Cowhouse Creek (41CV1549) and at the head of low-order tributaries (41BL155 and 41CV722). Intensive occupations at a site adjacent to a major lithic source area (41BL155) include a buried, intact burned rock midden with an internal hearth or earth oven and abundant lithic tools and debris.

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EXECUTIVE SUMMARY

WHAT IS THIS REPORT?

This report was prepared by Prewitt and Associates, Inc., Consulting Archeologists, of Austin, Texas, for the Directorate of Public Works, Environmental Management Office, Fort Hood, in compliance with Fort Hood's Historic Preservation Plan. Archeological investigations and assessments of 19 prehistoric sites on Fort Hood are reported.

WHAT WORK WAS DONE?

Archeological testing of the 19 sites was done to evaluate their eligibility for listing in the National Register of Historic Places (NRHP). Each site was tested to obtain archeological data that were then compared with the significance standards previously defined for NRHP-eligible sites at Fort Hood. Testing involved mechanical excavations using a backhoe and hand excavations of standard archeological units (usually 1x1 m). Forty-one backhoe trenches and 75 test units were dug, 18,406 artifacts were recovered, and 23 features were investigated. Besides evaluating site significance, the archeological evidence also was used to identify when prehistoric occupations occurred at each site and interpret the types of human activities involved.

WHAT ARE THE RESULTS?

Based on the results of archeological testing, part or all of 11 of the 19 sites are deemed to be important because they are likely to yield archeological data of sufficient quality and quantity to answer important research questions. It is recommended that the following 11 sites be considered eligible for listing in the NRHP:

41BL69	41BL827	41CV1480
41BL155	41CV722	41CV1482
41BL581	41CV1478	41CV1549
41BL582	41CV1479	

The other eight sites that were tested are recommended as not eligible for listing in the NRHP:

41BL181	41BL816	41CV1473
41BL579	41CV944	41CV1487
41BL667	41CV1348	

WHAT ARE FORT HOOD'S RESPONSIBILITIES

If Fort Hood and the Texas State Historic Preservation Officer concur with the recommendations presented herein, the 11 sites recommended eligible for listing in the NRHP should be preserved and protected. If preservation or protection for any of these sites is not possible, it is recommended that any adverse impacts that might occur in the future be mitigated through additional archeological excavations (i.e., data recovery). No further management is recommended for the eight sites deemed ineligible for listing in the NRHP.

ABSTRACT

Archeological testing of 19 prehistoric sites on Fort Hood was conducted during fiscal year 1995 by Prewitt and Associates, Inc., to evaluate each site's eligibility for listing in the National Register of Historic Places (NRHP) relative to the previously defined significance standards for Fort Hood. The 19 sites were tested with 41 backhoe trenches and 75 hand-excavated units from June through September 1995. The tested areas consist of 15 rockshelters, 6 open sites along the Leon River, and 4 other open sites. Based on the data obtained during the testing, it is recommended that 11 of the 19 tested sites (4 rockshelter sites, 4 Leon River sites, and 3 other open sites) be considered eligible for listing in the NRHP.

Within the 19 tested sites, 35 analysis units (i.e., horizontally distinct occupation areas and vertically distinct occupation zones) were defined. Radiocarbon dating of 25 organic samples (21 charcoal, 1 bulk sediment, and 3 terrestrial snail shells) provides the baseline chronometric data, which are supported by the recovery of 103 projectile points used as relative temporal indicators. This evidence indicates that almost all of the occupational episodes represented by the 35 analysis units occurred during the Late Archaic and Late Prehistoric (both Austin and Toyah phases) periods.

All but one of the tested rockshelters were occupied primarily during the Late Archaic and/or Late Prehistoric periods. Some were occupied intensively, while others appear to have been occupied on a sporadic and temporary basis. Most rockshelters on Fort Hood probably contain sediments no older than the late Holocene, and the paucity of earlier cultural evidence is thought to be due, at least in part, to geomorphic processes. It is unclear if rockshelters are recent, short-lived features on the landscape or if their sediments have been periodically flushed. Evidence of an ephemeral early Paleoindian occupation was encountered in one rockshelter (Shelter B at 41BL581), but this appears to be a relatively rare occurrence in Central Texas. Evidence of recent disturbance by vandalism was observed in most of the tested shelters, and some shelters have had their deposits severely disturbed or totally destroyed (e.g., Shelter A at 41BL69).

Evidence of intensive terminal Archaic and Austin phase into Toyah phase activities was found at four Leon River sites (41CV1478, 41CV1479, 41CV1480, and 41CV1482). Single or stratified occupation zones at these sites are buried within the Leon River paleosol, which appears to be a widespread temporal/horizon marker in West Range Alluvium within this section of the Leon River.

Investigations at other open campsites provide evidence of moderate to intensive occupations along Cowhouse Creek (41CV1549) and at the head of low-order tributaries (41BL155 and 41CV722). Intensive occupations at a site adjacent to a major lithic source area (41BL155) include a buried, intact burned rock midden with an internal hearth or earth oven and abundant lithic tools and debris. Compared with sites in alluvial deposits along major drainages at Fort Hood, fewer sites along low-order tributaries have been investigated, and there are few data pertaining to how low-order tributary sites may differ. The current investigation suggests that quantitative and qualitative differences may relate to cultural phenomena, such as seasonality and intensity of occupation or the kinds of resources being exploited.

ACKNOWLEDGMENTS

Fort Hood archeologist Dr. Jack Jackson died on 29 October 1996 after 7 years of directing the archeological program there. It is with much sadness that we at Prewitt and Associates observed the passing of our friend and colleague. Not only did Jack serve as Fort Hood's Contracting Officer's Representative during the 1995 Prewitt and Associates, Inc. (PAI), testing phase, but he also served in this capacity and guided the previous work and high-quality research of Texas A&M University and TRC-Mariah Associates, Inc. Due to Jack's efforts, the Fort Hood program was transformed into one of the most efficient and productive large-scale cultural resources management and archeological research programs in the country.

Fort Hood archeologist Kimball Smith was Jack's assistant and right-hand man during the field season and into the analysis phase. He participated during regulatory field visits and project meetings and was our first contact when problems arose. Kimball always responded to our requests promptly and quickly provided solutions to any problems. During Jack's illness, Kimball took over the Fort Hood CRM program and acted as COR for our contract. Guided by his steady hand, this transition occurred smoothly and efficiently at a time when chaos could easily have been the order of the day.

Other Fort Hood personnel also were important to the successful completion of our testing project. The backhoe was provided by Fort Hood DEH, Maintenance Division; Bill Roberts and James Conors coordinated the scheduling, while Lester Duncan was the backhoe operator. Duncan's skillful machine operation was an important component of our site testing program. While working in endangered species habitat and in caves or sinks, we coordinated our fieldwork with Gil Eckrich, John Cornelius, and Billy Ray (B. R.) Jones of the DEH, Environmental Management Office—Natural Resources Branch. Training Area Access and G3 Range Control (Officer Larry Ximenez) issued vehicle permits and coordinated our field schedules.

Elton Prewitt served as PAI's Principal Investigator for the 1995 testing project, and I served as Project Manager. Ross Fields served as Quality Control Officer and made frequent inspections to insure that the archeological work was done properly. Daily office business was attended to by Business Manager Linda Foster and Assistant Business Manager and Bookkeeper Jeanine Cuéllar.

Prior to beginning fieldwork, Charles Frederick (then at the Texas Archeological Research Laboratory) gave PAI personnel an introductory tour of the geomorphology of the project area. Frederick and Jim Abbott (then with TRC-Mariah) were consulted occasionally during our work for advice on matters of a geological or geomorphological nature. Their input helped reduce the "learning curve" for many of PAI's key project personnel (myself included) during the early stages of our work.

Once fieldwork began, Gemma Mehalchick served as Project Archeologist and Karl Kleinbach served as Assistant Project Archeologist. Together for the duration of the four-month field season, they did the following: coordinated their work with various Fort Hood divisions (e.g., DPW, DEH, Safety Office, and G3 Range Control); conducted site reconnaissance and backhoe testing; supervised one or two crews while directing hand excavations and recording of archeological data; videotaped site investigations; wrote preliminary site summary reports; used electronic surveying equipment to map sites; and supervised backfilling. After the fieldwork, Mehalchick and Kleinbach participated in all aspects of the analysis and were responsible for the lion's share of the report writing. They consulted closely with me during all phases of the fieldwork and analysis. Their dedication and

attention to detail are primary reasons that PAI's work was completed in a professional and competent manner, and I greatly appreciate their efforts.

Project Geomorphologist Karl Kibler personally investigated the geomorphic setting and stratigraphy of each tested site. Building upon the earlier work of several competent geomorphologists (i.e., Lee Nordt, Abbott, and Frederick), Kibler continued in the tradition by making careful and methodical observations, followed by thoughtful analyses and cautious interpretations.

The field crew for the 1995 testing project consisted of Shawn Capehart, Roman Clem, Carol Gavin, Ann Mesrobian, and Brent Scott. I thank these folks for completing their difficult tasks (such as digging deep test units in hard sediment; taking meticulous notes on excavation levels and features; fighting ticks, snakes, poison ivy, and other obnoxious flora and fauna; and putting up with weeks of summer days in excess of 100°) while maintaining a cheerful attitude and cooperative spirit.

For the Texas Historical Commission, Nancy Kenmotsu and Lain Ellis were the Department of Antiquities Protection reviewers who visited the project area to review our investigations.

In the laboratory, artifact processing and analysis was supervised by Laboratory Director Karen Gardner and Laboratory Assistant Audra Pineda. Their efficient tracking of all aspects of the lab work, from washing artifacts to curation, made everyone else's jobs much easier. Additional lab work was done by Kevin Stork. Lithic analyst Steve Tomka conducted his usual thorough and thoughtful study of the stone tools and debitage. Following the lead set by Texas A&M and TRC-Mariah, Tomka continued pursuing the research questions relating to raw material acquisition and use over the 339-mi^2 project area.

This report was edited and produced by Editor Melissa Hennigan and the figures were produced by Cartographer Brian Wootan.

Douglas K. Boyd
Austin, December 1996

INTRODUCTION

Douglas K. Boyd

1

The Fort Hood military reservation (Figure 1), a 339.6-mi^2 (217,337 acres) area of Bell and Coryell Counties, Texas, has been the scene of intensive archeological investigations since the late 1970s. This report documents the most recent archeological investigations completed as part of Fort Hood's ongoing Cultural Resources Management Program.

Following regulations (36 CFR 800) of the National Historic Preservation Act [16 U.S.C. 470(f) and 470h-2(f)] of 1966 (as amended), Fort Hood has been engaged in a program of inventorying and evaluating its cultural resources to determine the eligibility of historic properties for listing in the National Register of Historic Places (NRHP). Between 1977 and 1991, archeological surveys covering approximately 95 percent of the post documented over 2,200 prehistoric and historic archeological sites. In 1990, Fort Hood entered into a Programmatic Agreement among the United States Army, the Texas State Historic Preservation Officer (SHPO), and the Advisory Council for Historic Preservation. In accordance with this agreement, personnel from Fort Hood's Cultural Resources Management Program developed a Historic Preservation Plan in 1990; it was subsequently renewed in 1994 as a Cultural Resources Management Plan. The Historic Preservation Plan (Jackson 1990) and the Cultural Resources Management Plan (Jackson 1994a) established the long-range plan for managing Fort Hood's cultural resources. With the inventory of cultural resources essentially completed by 1990, the Fort Hood Cultural Resources Management Program began the process of evaluating the prehistoric archeological sites. Mariah Associates, Inc., of Austin, Texas, initiated the testing program and began evaluating prehistoric archeological sites in 1991. Their work included evaluations of 571 prehistoric sites in an intensive resurvey and shovel testing program, followed by more-intensive mechanical and hand testing of 113 sites. Since 1995, Prewitt and Associates, Inc., has continued to test and evaluate prehistoric archeological sites at Fort Hood in accordance with the Cultural Resources Management Plan.

Fort Hood issued two delivery orders to Prewitt and Associates in fiscal year 1995 (FY 1995). Work done under these delivery orders consisted of archeological testing and evaluation of 19 prehistoric sites and implementation of a pilot program to test the utility of electronic surveillance as a means of protecting sensitive archeological deposits in rockshelters. The work at the prehistoric sites is the focus of this report; the installation and testing of the electronic surveillance equipment has not been completed and will be reported at a later date.

The 19 sites investigated consist of 9 rockshelter sites (7 in the East Range near Lake Belton and 2 in the northern part of West Range), 6 open sites along the Leon River in the northern end of the post, and 4 other open sites (1 in West Range on Cowhouse Creek and 3 in East Range near Lake Belton). The locations of these site groupings are shown in Figure 2.

This report is organized into nine chapters and five appendixes. Chapter 2 presents general environmental background data for Fort Hood and describes specific environmental characteristics that distinguish the three site groupings mentioned above. Chapter 3 presents archeological background information for the Central Texas region and the Fort Hood project area and discusses the research design that guided the site testing. Chapter 4 describes field, laboratory, and analytical methods.

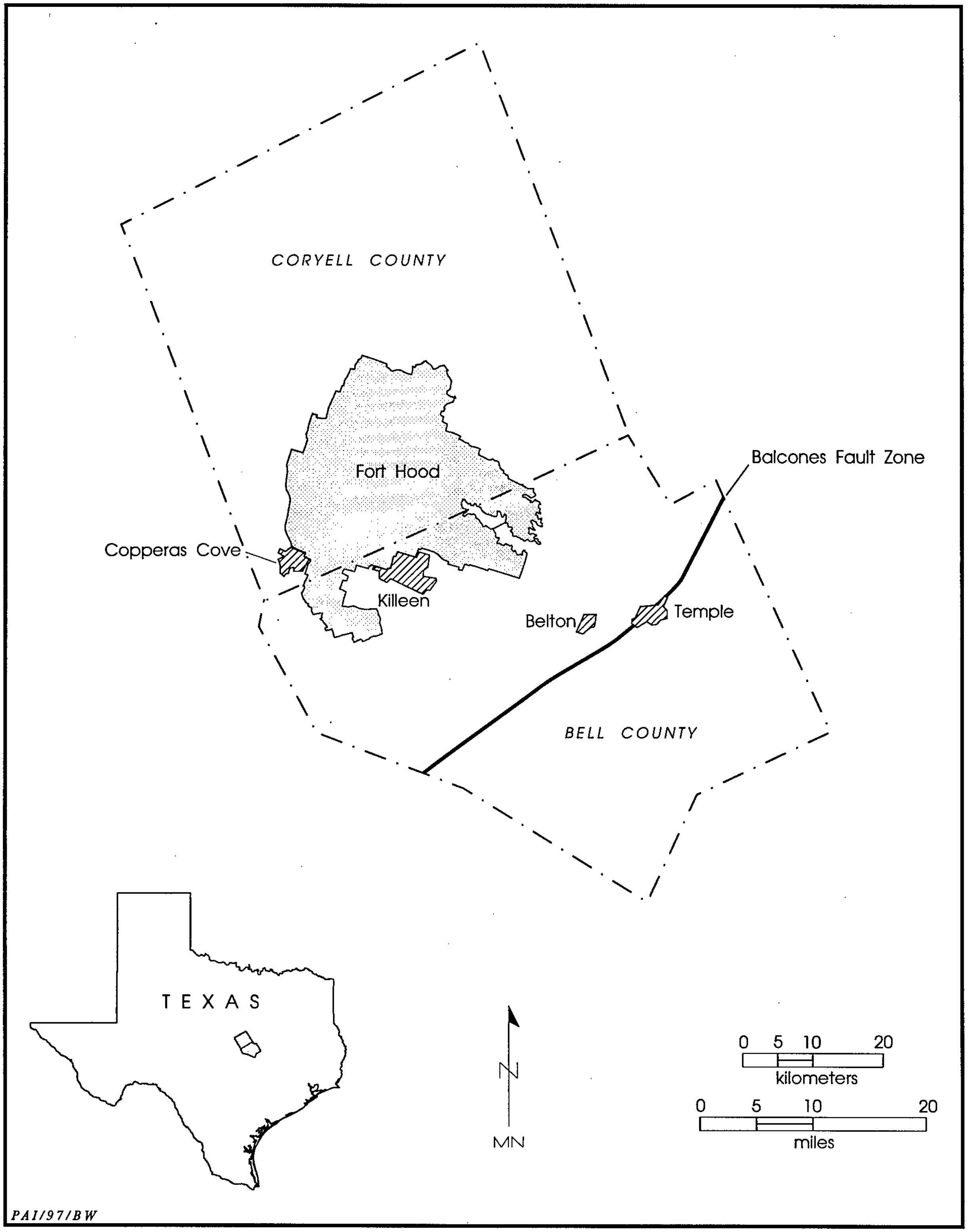

Figure 1. Location of Fort Hood (modified from Trierweiler, ed. 1994).

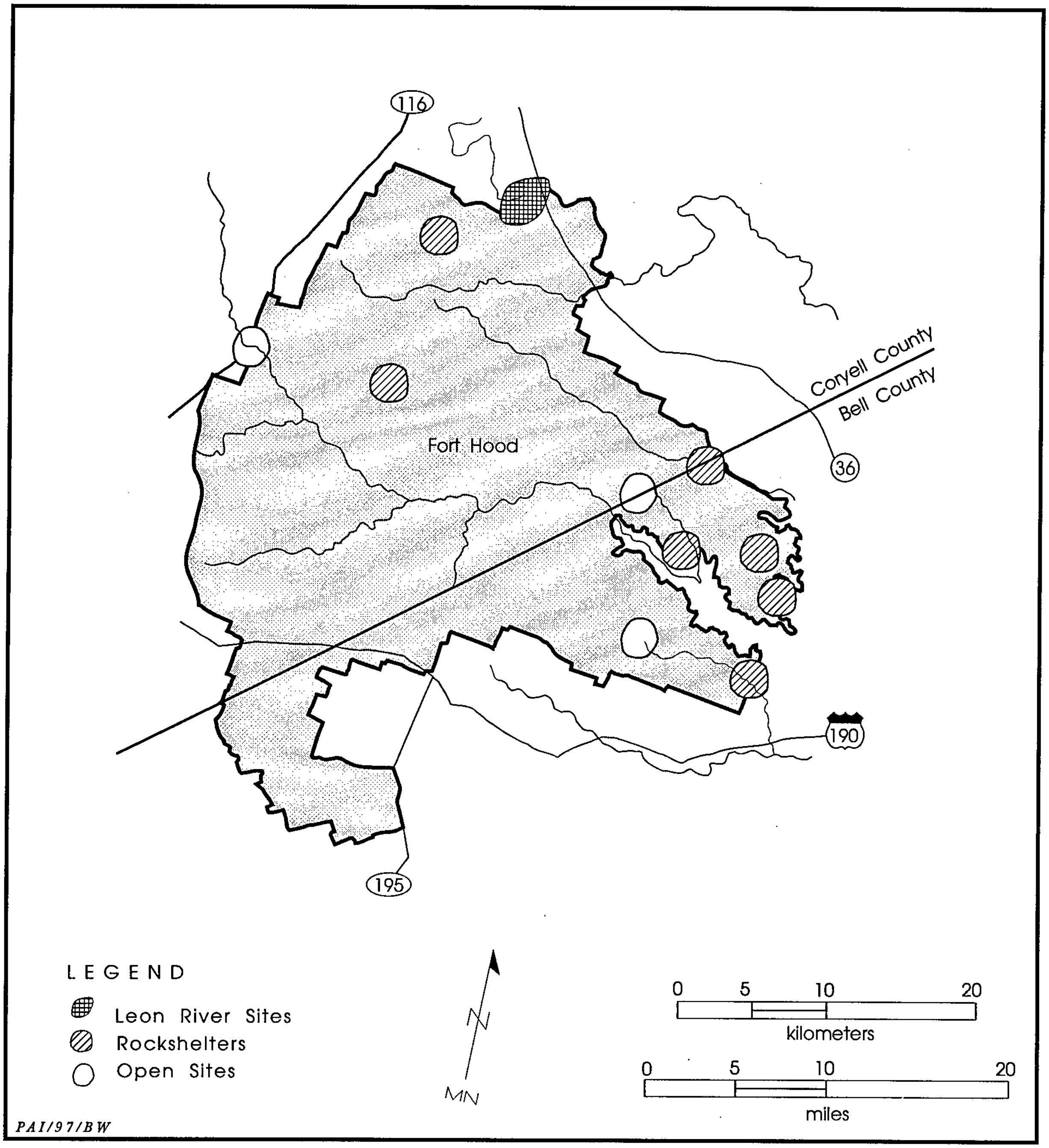

Figure 2. Locations of investigated sites.

Chapters 5 and 6 describe the results of prehistoric site testing in Bell (n = 9) and Coryell (n = 10) Counties, respectively. In addition to providing information on site setting and previous archeological work, each site summary discusses the level of testing, artifacts recovered, features encountered, chronological assessment and geomorphic context of the cultural deposits, and interpretations of the cultural data. When appropriate, horizontally and/or vertically discrete cultural zones that are reasonably well dated are defined as separate analytical units. These analysis units reflect the most discrete groups of cultural materials/features that may

be defined based on the limited testing results.

Cultural materials recovered from all sites are described in Chapter 7. The following analytical categories are used for description: chipped stones, ground/battered stones, modified bones and shells, burned and fire-cracked rocks, unmodified bones and shells, and macrobotanical remains. Chapter 8 interprets the data by comparing and contrasting archeological and geomorphic observations pertaining to the three groups of sites, i.e., rockshelters, Leon River sites, and other open sites. In addition, inferences concerning cultural behavior are offered based on detailed intersite comparisons of lithic assemblages, features, and subsistence data. The final chapter summarizes the testing results and recommendations of NRHP eligibility for all 19 sites and recommends appropriate strategies for data recovery or more-intensive testing preparatory to data recovery. Chapter 9 concludes with general recommendations for Fort Hood's Cultural Resources Management Program.

Appendix A summarizes all of the radiocarbon dates (n = 25) obtained during the FY 1995 investigations, providing corrected radiocarbon ages, $\delta^{13}C$ values, and tree-ring calibrations. Geological descriptions of selected stratigraphic profiles (backhoe trenches and/or test units) are presented in Appendix B. The final two appendixes describe the results of special studies of selected samples by consultants from Texas A&M University; an analysis of faunal remains by Barry Baker is presented in Appendix C, and an analysis of macrobotanical remains by Phil Dering is presented in Appendix D. Finally, the Fort Hood chert typology established by TRC-Mariah is presented in Appendix E.

ENVIRONMENTAL BACKGROUND

Karl W. Kibler

2

Fort Hood is located in the Lampasas Cut Plain, a subprovince of the Grand Prairie (Hayward et al. 1996), and is dissected by the northeastern edge of the Edwards Plateau (Hill 1901). The area represents a transitional zone from the more humid east to the semiarid west, and the environmental gradient is steep enough that distinct changes in landscape and vegetation are observable moving east to west across Fort Hood. Geologically, Fort Hood is situated west of the Balcones fault zone on lower Cretaceous-age carbonate rocks. A clear and distinct escarpment does not exist along the fault zone in the Fort Hood area; however, distinct differences do exist between the soils and vegetation developed on the upper Cretaceous (Gulfian Series) rocks east of the fault zone and those developed on the lower Cretaceous (Comanchean Series) rocks to the west (Abbott 1995a:5).

CLIMATE

The modern climate of the Fort Hood area is subtropical, characterized by hot, humid summers and relatively short, dry winters (Natural Fibers Information Center 1987:6). The prevailing wind blows from the south, reaching its peak strength during the spring. Summer temperatures are high, with an overall average of 83°F (28.3°C) and an average daily maximum of 96°F (35.5°C) in Coryell County. The average temperature in winter is 49°F (9.4°C), but tends to vary considerably due to the periodic passage of northern cold fronts, resulting in a pattern of alternating cold and mild days (McCaleb 1985:3).

Annual precipitation is approximately 32.5 inches (826 mm) for Coryell County (Natural Fibers Information Center 1987:121). Although rainfall occurs year-round, the overall distribution pattern is bimodal, with peak rainfall occurrences in the late spring and early fall.

FLORA AND FAUNA

The flora and fauna of Fort Hood are typical of the Balconian and Texan biotic provinces (Blair 1950). The biotic assemblage represents a mix of species from the Blackland Prairie to the east and the Edwards Plateau to the west. Many specific ecological niches also exist across the base, depending on the local topography, slope aspect, soil, and geology. The eastern side of the facility is characterized by dense juniper/oak forest and scrub, while upland areas to the west and south are generally more open. Grasslands are most common on the intermediate upland surfaces, while the high upland surface is typically covered by juniper/oak scrub. Riparian zones are common along drainages; they exhibit a variety of hardwood species.

The Balconian faunal assemblage includes 57 species of mammals, but none of these species are solely restricted to the Balconian province (Blair 1950:113). Eight of these species also inhabit the Texan province to the east and the interconnecting riparian zones (Blair 1950:101). Other native fauna includes 36 species of snakes, 15 anuran species, and 16 species of lizards. Several prehistorically significant economic species, such as bison and pronghorn antelope, have been removed from the area in historic times.

GEOLOGY, GEOMORPHOLOGY, AND LATE QUATERNARY STRATIGRAPHY

The Fort Hood landscape consists of the dissected northeastern margin of the uplifted

Edwards Plateau and reflects the variable resistances of the various underlying geologic formations to erosion. Structurally, the area is underlain by a deeply buried extension of the Paleozoic-age Ouachita Mountains, which divide the stable continental interior to the west from the subsiding Gulf basin to the southeast. During the Cretaceous Period, this region consisted of a very broad shelf covered by a shallow sea. Limestones and marls were deposited on the shelf as the shoreline fluctuated for more than 80 million years. Occasionally, relatively thin deposits of sand derived from terrestrial sources also accumulated on the shelf, resulting in interbedded formations like the Paluxy Sandstone, Hensell Sandstone, and Antlers Formation. The Gulf basin subsided during the Miocene, resulting in the development of the Balcones fault zone along the old Ouachita line and the uplift of the Edwards Plateau (Woodruff and Abbott 1986). West of the Balcones fault, the Cretaceous-age limestones and marls remain relatively horizontal and structurally unmodified, while to the east the Cretaceous-age rocks dip sharply Gulfward and are buried deeply by Gulfian and later lithological units.

Because Fort Hood is west of the fault zone, it is underlain by relatively flat-lying lower Cretaceous rocks exhibiting a two-tiered topography locally termed the Lampasas Cut Plain (Hayward et al. 1990). This landscape developed between the Brazos and Colorado Rivers and consists of large, mesalike remnants of an early Tertiary-age planation surface surrounded by a broad, rolling pediplain formed during the late Tertiary and early Quaternary. These two surfaces differ by 25 to 40 m in elevation and form the "high" and "intermediate" uplands of Hayward et al. (1990) and the "Manning" and "Killeen" surfaces of Nordt (1992). Modern stream valleys are incised approximately 40 to 70 m into the pediplain surface.

The oldest rocks exposed at Fort Hood belong to the Trinity Group, including the Glen Rose Formation and Paluxy Sandstone. These formations are surficially exposed on the western side of Fort Hood, where relatively deep incision of the landscape by Cowhouse Creek and its tributaries has removed the overlying rocks (Barnes 1979; Sellards et al. 1932).

Resting on the Trinity Group are rocks of the lower Cretaceous Fredericksburg Group. The lowest unit is the Walnut Clay, which is widely exposed at Fort Hood and forms the principal substrate of the Killeen surface. Above the Walnut Clay lies the Comanche Peak Limestone, which forms the intermediate slopes of the higher Manning surface. The highest extensive lithological unit is the Edwards Group, including the Edwards Limestone which forms the resistant cap of the high upland mesas or Manning surface. Edwards Group formations also are a very important source of high-quality chert (see Frederick and Ringstaff 1994; Frederick et al. 1994).

The stratigraphy and soil geomorphology of a number of larger Fort Hood streams have been studied in detail by Nordt (1992, 1993, 1995), who identifies six principal alluvial units in the study area. From oldest to youngest, these units are termed the Reserve alluvium, Jackson alluvium, Georgetown alluvium, Fort Hood alluvium, West Range alluvium, and Ford alluvium (Nordt 1992). The Reserve alluvium is a fill of middle to late Pleistocene age that forms the T_3 terraces of the Leon River. The Jackson alluvium is approximately 15,000 years old and consists of 3–4 m of gravelly and loamy deposits resting on a bedrock strath. It forms the T_2 terraces of the Leon River and Cowhouse Creek and its larger tributaries. The Georgetown alluvium is the oldest unit within the deeply entrenched Holocene valley of Cowhouse Creek and its larger tributaries. It is always buried below the T_1 terrace surface. Deposition of this unit began no earlier than 11,300 B.P. and terminated by 8200 B.P. (Nordt 1992). The 4- to 6-m-thick fill consists of gravelly and loamy deposits. The Royalty paleosol, formed on top of the Georgetown alluvium, typically consists of a truncated Bk horizon containing secondary precipitates of calcium carbonate. The Fort Hood alluvium is the major Holocene unit by volume along Cowhouse Creek and most of its tributaries. It consists of 9–10 m of gravelly and loamy deposits that date between about 8000 and 4800 B.P. The West Range alluvium accumulated in two episodes between 4200 and 600 B.P., with a brief erosional period between 3000 and 2000 B.P. The West Range unit is typically 9 m thick; it partially truncates and buries the Fort Hood alluvium in some areas. The Fort Hood and West Range alluviums aggraded to the same elevation in many of the valleys, making the T_1 surface diachronic. Deposition of the Ford alluvium and construction of the modern floodplain, T_0, began 400 to 600 years

ago and is continuing to the present.

In addition to the alluvial deposits within the stream valleys, colluvial and slopewash sediments also form culturally relevant deposits within the base. These deposits occur both as relatively thick wedges of sediment at the base of steeper slopes and as thin mantles on most slopes and uplands, and they interdigitate with a number of alluvial fills at valley margins. Also archeologically significant are rockshelters and their accompanying sedimentary fills. Rockshelters and small overhangs are very common at Fort Hood, and the nature of shelter fills varies from shelter to shelter. Abbott (1995b:835) has defined and interpreted six types of rockshelter fills and their origins. This typology is discussed in greater detail below.

ENVIRONMENTAL SETTING OF THE CURRENT INVESTIGATIONS

The majority of the sites investigated in this report fall into two environmental and geomorphic settings. These settings are the Leon River valley and its tributary, Turnover Creek, and rockshelters formed along the intervening slopes of the Killeen and Manning surfaces. Four other sites (open air sites) fall outside these two specific environments, although there are similarities between the settings of these four sites and the two specific environments described below.

Six sites were tested along the Leon River and its tributary, Turnover Creek. Two (41CV1549 and 41BL155) of the four sites outside the Leon River valley are located in similar riparian settings. The Leon River forms a portion of the northern boundary of Fort Hood. Its drainage basin is 9,174 km^2 (Nordt 1992:Table 1), covering primarily Cretaceous-age limestones, shales, and marls (Barnes 1972, 1976, 1979). Within Fort Hood, the Leon River is entrenched into the Walnut Clay. The modern river is an underfit stream, flowing in a small, tight, meandering channel compared to its wide valley. Nordt (1992:53) mapped four alluvial surfaces, T_3, T_2, T_1, and T_0 terraces or floodplains (Figure 3). All of the sites investigated were located on the T_2 or T_1 terraces. Soils formed on these two surfaces belong to the Bosque-Frio-Lewisville and Bastsil-Minwells soil associations (McCaleb 1985). Mollisols are the dominant soil order and include loamy calcareous Bosque (Cumulic Haplustoll) and Lewisville (Typic Calciustoll) soils and clayey calcareous Frio (Cumulic Haplustoll) soils. Alfisols are of secondary importance and include loamy siliceous Bastsil (Udic Paleustalf) soils.

The vegetation within this Balconian riparian zone (Blair 1950) is dominated by arboreal species, including pecan (*Carya illinoinensis*), slippery elm (*Ulmus rubra*), bur oak (*Quercus macrocarpa*), black walnut (*Juglans nigra*), plum (*Prunus americana*), American elm (*Ulmus americana*), netleaf hackberry (*Celtis reticulata*), and red mulberry (*Morus rubra*). Understory vegetation includes sedges (*Cyperus* sp.), switchgrass (*Panicum virgatum*), eastern gamagrass (*Tripsacum dactyloides*), sideoats grama (*Bouteloua curtipendula*), silver bluestem (*Bothriochloa saccharoides*), big bluestem (*Andropogon gerardii*), and little bluestem (*Schizachyrium scoparium*).

The riparian zone paralleling the Leon River is a resource-rich area and most likely was heavily utilized by prehistoric peoples. A reliable water source and dense groves of nut-bearing trees would have been attractive to white-tailed deer and provided excellent habitat for turkeys, turtles, freshwater mussels, and other fauna.

Nine of the tested sites contained rockshelters formed along limestone bluffs and slopes. Sites 41BL816 and 41CV722, while not rockshelters, are located in similar slope environments. Rockshelters form a very important part of the upland edge/slope environments of Fort Hood. Most of the shelters are associated with the margins of the Manning surface; they formed due to weathering of the softer and more thinly bedded Comanche Peak limestones below the massive beds of Edwards Limestone. Rockshelters associated with the Walnut Clay and Glen Rose Limestone are very uncommon (Abbott 1994a:32). Shelter fills vary across the base due to variations in the ages, depositional agents, and parent materials of deposits in shelters in different geologic settings. Abbott (1995b:835, Table 9.15) has defined six types of rockshelter fill (Table 1), and his typology is used in the descriptions of rockshelter fills in this report.

Within the Balconian biotic province (Blair 1950), the vegetation on the slopes and around rockshelters at Fort Hood differs from that of the riparian floral communities. The dominant arboreal species include live oak (*Quercus*

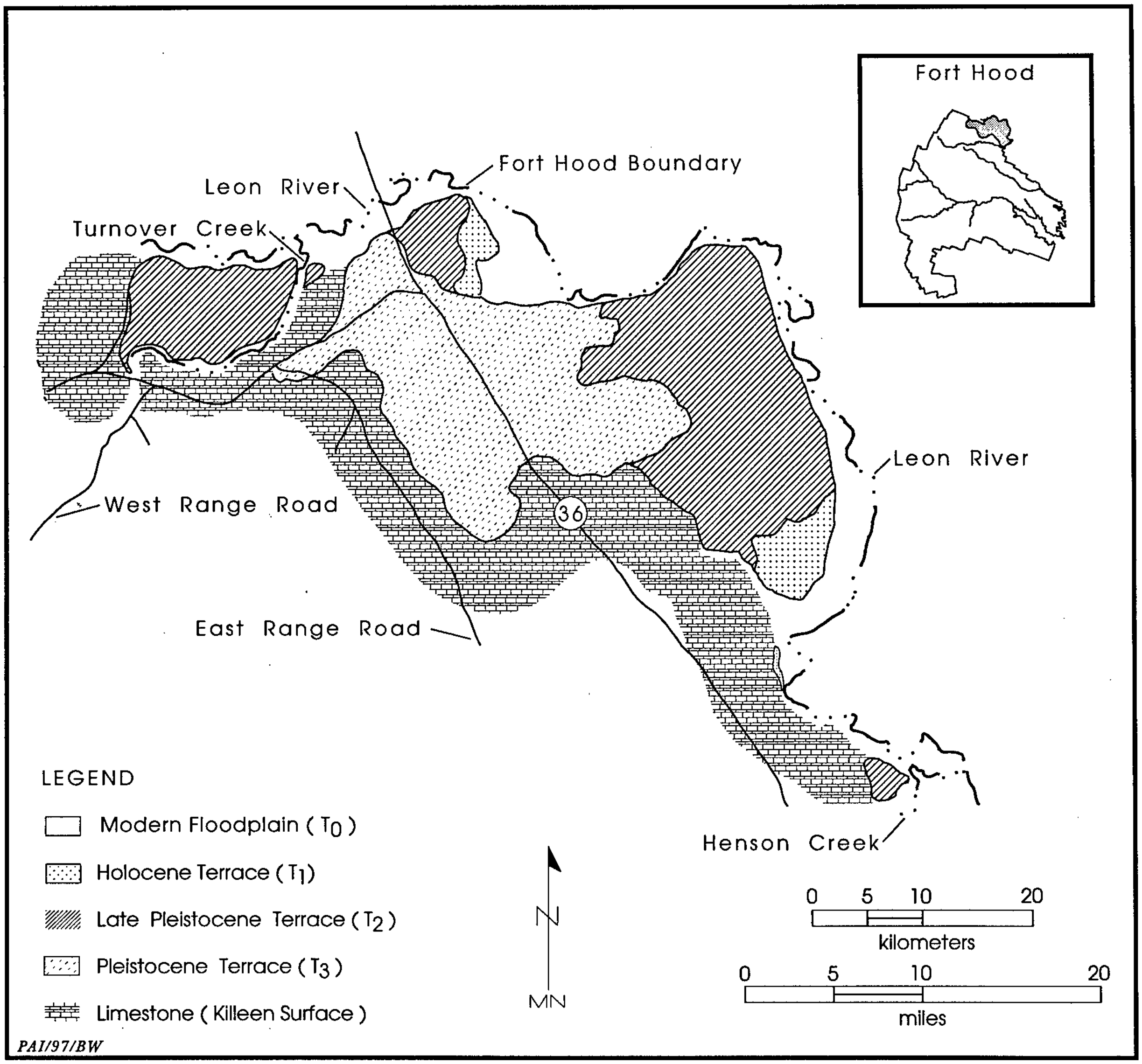

Figure 3. Geomorphic map of the Fort Hood section of the Leon River (modified from Nordt 1992:Figure 24).

virginiana), Texas oak (*Q. texana*), Bigelow oak (*Q. sinuata* var. *breviloba*), and juniper (*Juniperus ashei*). Minor arboreal species include ash (*Fraxinus* sp.), redbud (*Cercis canadensis*), hackberry (*Celtis* sp.), Texas persimmon (*Diospyros texana*), and Mexican buckeye (*Ungnadia speciosa*). Understory vegetation includes Wright three-awn (*Aristida wrightii*), purple three-awn (*A. purpurea*), tall dropseed (*Sporobolus asper*), silver bluestem (*Bothriochloa saccha-roides*), cane bluestem (*B. barbinodis*), maidenhair fern (*Adiantum capillus-veneris*), and other ferns.

Fauna in upland edge/slope settings where rockshelters are found include species of rabbits, rodents, turkeys and various other birds, coyotes, and white-tailed deer. Not only do these species utilize the juniper/oak scrub of the upland edge/slope, but they also may utilize the shelters themselves; many animals may be attracted to the springs and seeps commonly associated with rockshelters.

Archeological evidence from previous investigations at Fort Hood suggests short, intermediate, and long-term human utilization of rockshelters. For the most part, shelter occupa-

Table 1. Fort Hood rockshelter fill typology*

Sediment Type	Description	Origin
1	Light gray, gray-brown, yellowish brown, or tan silt with various amounts of coarse limestone spall. Also includes sediment with high ash content and/or high organic matter decomposing in a relatively dry microenvironment.	Internal decomposition of shelter walls and roof; also includes additions of cultural (e.g., ash) and organic (e.g., decomposing leaf litter) sediments blown, washed, or dropped into the shelter.
2	Stratified, multicolored (red, orange, yellow, brown, gray, black, or white) silts with variable amounts of coarse incorporated spall and organic lenses.	Internal decomposition of shelter walls and roof; redox reactions due to intermittent saturation; organic-rich cultural strata.
3	Dark grayish brown to black clay loam or stony clay loam; includes varying amounts of coarse limestone spall.	Primarily deposition of external sediments derived from erosion of upland A horizon and weathered internally.
4	Reddish brown to red clay loam and stony clay loam, usually structureless but occasionally may exhibit blocky structure.	External sediment derived from erosion of upland Bt horizon; introduced over bluff edge and/or through spring conduits. In some instances, the blocky-structured sediments may represent an in situ Bt horizon.
5	Tufa, commonly associated with abundant algal colonies, and travertine.	Precipitation from ground water in situ.
6	Coarse lag/flushed shelters.	Lack of accumulation and/or flushing by overland flow or ground water discharge.

*As defined by Abbott 1995b:Table 9.15

tions occurred in the Late Archaic through Late Prehistoric periods. Whether this is a result of cultural preferences or natural processes, such as short life spans of individual shelters before collapsing or erosional removal of shelter fills during the middle Holocene, is unclear at this time.

ARCHEOLOGICAL BACKGROUND AND RESEARCH CONTEXTS

Karl W. Kibler and Douglas K. Boyd

3

REGIONAL CULTURAL CHRONOLOGY AND PALEOENVIRONMENTAL RECONSTRUCTION

The prehistoric cultural sequence for Central Texas can be divided into three broad periods: Paleoindian, Archaic, and Late Prehistoric, although the terms Neoarchaic (Prewitt 1981, 1985) and Post-Archaic (Johnson and Goode 1994) have been used at times in place of Late Prehistoric. Prewitt's (1981, 1985) cultural-historical framework incorporating discrete temporal and technological units (i.e., phases) is used by many researchers, but recently revised chronologies have been proposed by Johnson and Goode (1994) and Collins (1995). These revisions do not use the term phase to describe cultural-historical units; instead, named intervals or patterns based on diagnostic projectile point styles and associated radiocarbon assays (e.g., Martindale-Uvalde interval of the Early Archaic period) within each period or subperiod are used. These three cultural chronologies are compared in Figure 4. Figure 5 compares paleoenvironmental reconstructions offered by Johnson and Goode (1994) and Collins (1995) with paleoenvironmental models offered by Nordt et al. (1994) and Toomey et al. (1993) for the Central Texas region.

The Paleoindian period (11,500–8800 B.P.) represents the earliest known cultural manifestation in North America. Sites and isolated artifacts from this period are fairly common across Central Texas. The period is often described as having been characterized by small but highly mobile bands of foragers who were specialized hunters of Pleistocene megafauna. A more accurate view of Paleoindian lifeways includes the utilization of a much wider array of subsistence resources. Recent investigations at the Wilson-Leonard site (41WM235) support this view and have challenged the fundamental defining criteria of the Paleoindian period, that of artifacts in association with late Pleistocene megafauna (Masson and Collins 1995). Environmental conditions during the Paleoindian period were quite different than today, presenting the early inhabitants with a different array of resources. Nordt et al. (1994) view this period as a transition between cooler and moister late Pleistocene conditions and warmer and drier Holocene conditions. They estimate that warm-season or C_4 grasses steadily increased in abundance throughout this period. Toomey et al. (1993) also see this time as a period of transition, with summer temperatures increasingly rapidly but still 2–3°C below modern values. Toomey et al. (1993) suggest that a decrease in effective moisture beginning around 14,000 B.P. intensified and culminated ca. 10,500 B.P.

Collins (1995) divides the Paleoindian period into early and late subperiods. The early subperiod consists of two projectile point style intervals, Clovis and Folsom. Clovis chipped stone artifact assemblages, including the diagnostic fluted lanceolate Clovis point, were produced by bifacial, flake, and prismatic-blade techniques on high quality and oftentimes exotic lithic materials (Collins 1990). Along with chipped stone artifacts, Clovis assemblages include engraved stones, bone and ivory points, stone bolas, and ochre (Collins 1995:381; Collins et al. 1992). Clovis artifacts suggest well-adapted, generalized hunter-gatherers who possessed the technology to hunt larger game but did not solely rely on it. In contrast, Folsom tool kits, consisting of fluted Folsom points, thin unfluted (Midland) points, large thin bifaces, and

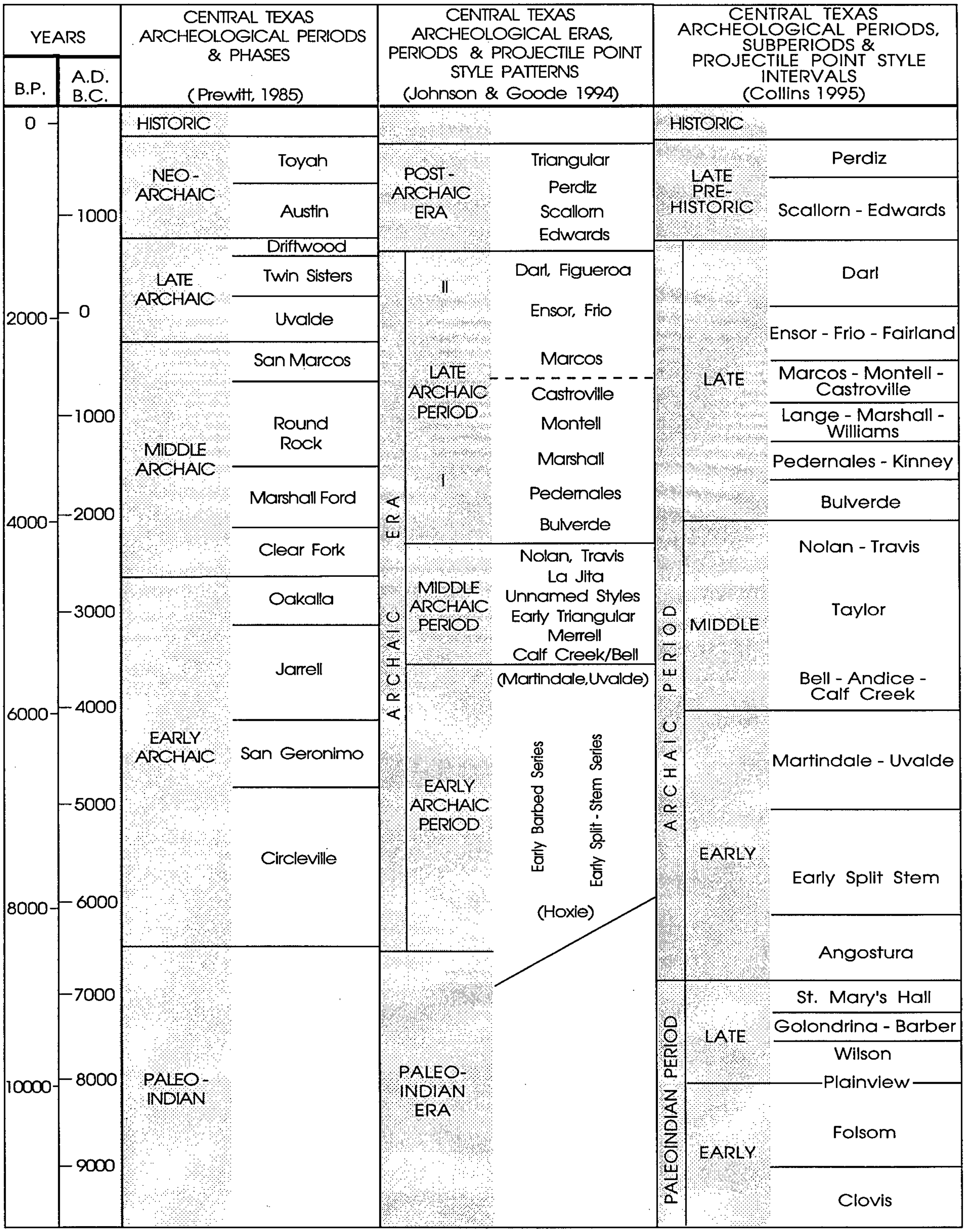

Figure 4. Prehistoric cultural sequences of Prewitt (1985:Figure 5), Johnson and Goode (1994:Figure 2), and Collins (1995:Table 2).

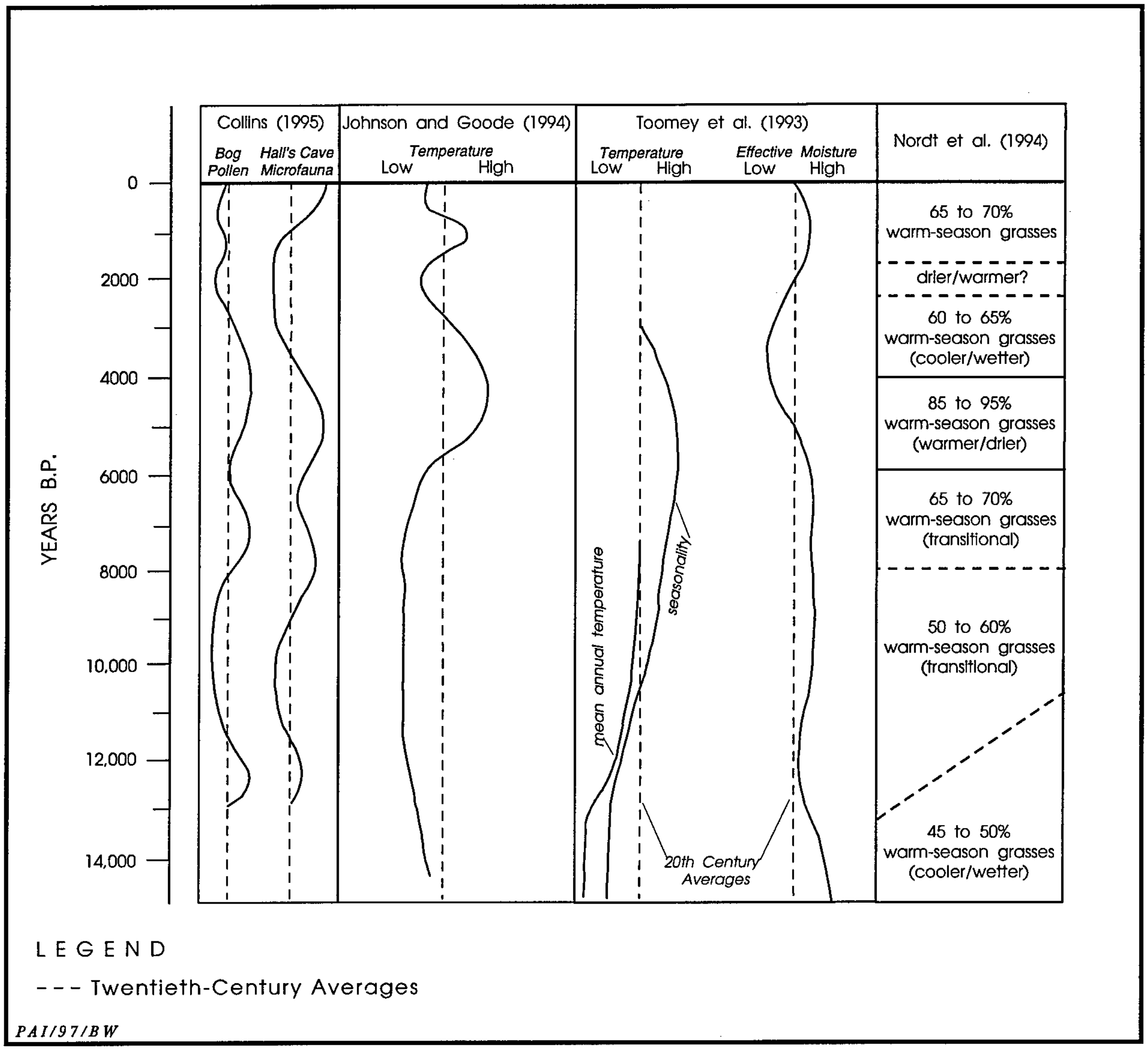

Figure 5. Late Pleistocene and Holocene paleoenvironmental records of Collins (1995:Table 2), Johnson and Goode (1994:Figure 2), Toomey et al. (1993:Figure 9), and Nordt et al. (1994:Figure 4).

end scrapers, are more indicative of specialized hunting, particularly of bison (Collins 1995:382).

Spanning the late Paleoindian subperiod are several projectile point styles for which temporal, technological, or cultural significance is unclear. Plainview, a type name typically assigned to any unfluted, lanceolate Paleoindian point, is one example. Collins (1995:382) has noted that most of these points are not similar to the Plainview type-site points in thinness and flaking technology. Also problematic are the chronological position and cultural significance of Dalton and San Patrice dart points. The succeeding late Paleoindian subperiod includes three projectile point style intervals: Wilson (ca. 10,000–9650 B.P.), Golondrina-Barber, and St. Mary's Hall (9500–8800 B.P.). Components and artifact and feature assemblages of these three intervals appear to be Archaic-like in nature and in many ways may represent a transition between the early Paleoindian and succeeding Archaic periods (Collins 1995:382).

The Archaic period (8800 to 1300–1200 B.P.) is generally believed to represent a shift toward hunting and gathering of a wider array of animal and plant resources and a decrease in group

mobility (Willey and Phillips 1958:107–108), although such changes may have been well under way by the beginning of the period. Throughout the ca. 7,600-year-long period, major climatic changes probably presented Archaic populations with varying subsistence challenges. The Archaic is generally subdivided into Early, Middle, and Late subperiods (Black 1989; Collins 1995; Story 1985:28–29). Each of the three Archaic subperiods includes several temporal-stylistic units or intervals based on diagnostic projectile point styles and associated radiocarbon assays (Collins 1995).

Early Archaic (8800–6000 B.P.) sites are small, and their tool assemblages are very diverse (Weir 1976:115–122). This suggests that groups were highly mobile and population densities were low (Prewitt 1985:217). It has been noted that Early Archaic sites are concentrated along the eastern and southern margins of the Edwards Plateau (Johnson and Goode 1994; McKinney 1981). This distribution may be indicative of climatic conditions at the time, as these environments had many more-reliable water sources and a diverse subsistence base. Microfaunal records and sedimentary evidence from stream valleys and caves along the eastern Edwards Plateau depict a climatic regime in flux, from mesic conditions during the beginning of the Early Archaic to extremely xeric and back to mildly xeric conditions at the end of the subperiod (Collins et al. 1990; Toomey et al. 1993). Three projectile point style intervals are recognized: Angostura; Early Split Stem, including Gower and Jetta; and Martindale-Uvalde. Manos, metates, hammerstones, Clear Fork and Guadalupe bifaces, and a variety of other bifacial and unifacial tools are common to all three intervals. The construction and use of rock hearths and ovens reflect a specialized subsistence strategy (exploitation of roots and tubers?) during the Early Archaic. These burned rock features most likely represent the technological predecessors of the larger burned rock middens used extensively later in the Archaic period (Collins 1995:383).

During the Middle Archaic period (6000–4000 B.P.) the number and distribution of sites, as well as site size, increased due to probable increases in population densities (Prewitt 1981:73; Weir 1976:124, 135). Macrobands may have formed at least seasonally, or increased numbers of small groups may have utilized the same sites for longer periods of time (Weir 1976:130–131). A greater reliance on plant foods is suggested by the presence of burned rock middens toward the end of the Middle Archaic, although tool kits still imply a strong reliance on hunting (Prewitt 1985:222–226). Three projectile point style intervals comprise the Middle Archaic: Bell-Andice-Calf Creek, Taylor, and Nolan-Travis. The Bell-Andice-Calf Creek and Taylor intervals reflect a shift in lithic technology from the preceding Martindale-Uvalde (Collins 1995:384).

Johnson and Goode (1994:25) suggest that the Bell-Andice-Calf Creek interval represents an influx of bison-hunting groups from the Eastern Woodland margins into the Central Texas region during a slightly more mesic period. Bison disappeared as more-xeric conditions returned during the later Nolan-Travis interval. The style change represents another shift in lithic technology (Collins 1995:384; Johnson and Goode 1994:27). Prewitt (personal communication 1996) postulates that the production and morphology of Travis and Nolan points are similar to projectile points from the Lower Pecos region. Such characteristics as beveled stems and overall morphology may have originated in the Lower Pecos, since their presence there predates their appearance in Central Texas. The accompanying change to more-xeric conditions bears witness to the construction and use of burned rock middens. Johnson and Goode (1994:26) believe that the dry conditions promoted the spread of xerophytic plants, such as yucca and sotol, and that these plants were collected and cooked in large rock ovens by late Middle Archaic peoples.

Both Collins (1995) and Johnson and Goode (1994) recognize a period of extreme aridity in Central Texas during the Archaic period; the construction and use of burned rock middens were probable responses to these xeric conditions. However, Collins (1995), as well as Nordt et al. (1994) and Toomey et al. (1993), views these xeric conditions as the culmination of a continual decrease in effective moisture since the end of the Pleistocene, while Johnson and Goode (1994) do not. In addition, Johnson and Goode (1994) believe the period of aridity (their Edwards Interval) occurred slightly later, at ca. 4250–2550 B.P., compared to Collins's (1995) much longer Altithermal climate at 8500–6800 and 5500–3000 B.P. (cf. Nordt et al. [1994] and Toomey et al. [1993] in Figure 2).

During the succeeding Late Archaic period (4000 to 1300–1200 B.P.), populations continued to increase (Prewitt 1985:217). The establishment of large cemeteries along drainages suggests strong territorial ties by certain groups (Story 1985:40). Xeric conditions continued but became more mesic ca. 3500–2500 B.P. The Late Archaic period encompasses six projectile point style intervals (Collins 1995:376): Bulverde, Pedernales-Kinney, Lange-Williams-Marshall, Marcos-Montell-Castroville, Ensor-Frio-Fairland, and Darl. Johnson and Goode (1994:29–35) divide the Late Archaic into two parts, Late Archaic I and Late Archaic II, based on increased population densities and evidence of Eastern Woodland ceremonial rituals and religious ideological influences. Middle Archaic subsistence technology, including the use of burned rock middens, continued into the Late Archaic period. Collins (1995:384) states that during the Pedernales-Kinney interval the construction and use of burned rock middens reached its zenith and that their use declined during the latter half of the Late Archaic. However, there is mounting chronological data that midden formation and use culminated much later, during the Ensor-Frio-Fairland and Darl intervals, and that this high level of use continued into the early Late Prehistoric period (Black et al. 1997; Kleinbach et al. 1995:795). That burned rock midden use in the eastern part of Central Texas was prevalent after 2000 B.P. is gradually becoming clear. This scenario parallels the widely recognized occurrence of post-2000 B.P. middens in the western reaches of the Edwards Plateau (see Goode 1991). The use of burned rock middens appears to have been a major part of the subsistence strategy as a decrease in the importance of hunting, inferred by the low ratio of projectile points in relation to other tools in site assemblages, may have occurred (Prewitt 1981:74).

The Late Prehistoric period (ca. 1300–1200 to 300 B.P.) is marked first by the introduction of the bow and arrow into the region, and later by the appearance of ceramics. These innovations probably came from the north, by persons or mechanisms unknown (Prewitt 1985:228). Population densities dropped considerably from their Late Archaic peak (Prewitt 1985:217). The use of burned rock middens for plant food processing continued throughout the Late Prehistoric period (Black et al. 1997; Goode 1991; Kleinbach et al. 1995:795). Subsistence strategies did not differ greatly from the preceding period, although bison became an important economic resource during the later part of the Late Prehistoric period (Prewitt 1981:74). In the western portion of Central Texas, the use of burned rock middens for plant food processing continued (Goode 1991). Horticulture came into play very late in the region and was of minor importance to the overall subsistence strategy (Collins 1995:385).

In Central Texas, the Late Prehistoric period is generally associated with the Austin and Toyah phases (Jelks 1962; Prewitt 1981:82–84); however, both phases have a much wider application. Austin and Toyah phase horizon markers, Scallorn-Edwards and Perdiz arrow points, respectively, are distributed across most of the state. The introduction of Scallorn and Edwards points into Central Texas is often marked by evidence of violence and conflict; many excavated burials from this period contain these arrow tips in contexts indicating they were the cause of death (Prewitt 1981:83). Subsistence strategies and technologies (other than the shift from dart to arrow points) did not change much from the preceding Late Archaic. This continuity is recognized by Prewitt's (1981) use of the term "Neoarchaic." In fact, Johnson and Good (1994:39–40) and Collins (1995:385) state that the break between the Late Archaic and the Late Prehistoric could be easily and appropriately represented by the break between the Austin and Toyah phases.

Around 1000–750 B.P., slightly more xeric or drought prone climatic conditions returned to the region, and bison returned to the region in large numbers (Huebner 1991; Toomey et al. 1993). Utilizing this vast resource were Toyah phase peoples equipped with Perdiz-tipped arrows, end scrapers, four-beveled knives, and plain bone-tempered ceramics. The technology and subsistence strategies of the Toyah phase represent a completely different tradition than the preceding Austin phase. Collins (1995:388) states that burned rock middens fall out of use, as bison hunting and group mobility obtained a level of importance not witnessed since Folsom times. While the importance of bison hunting and high group mobility can hardly be disputed, the cessation of burned rock midden use during the Toyah phase is tenuous. A recent examination of Toyah-age radiocarbon assays and assem-

blages by Black et al. (1997) suggests that their association with burned rock middens represents more than a "thin veneer" capping Archaic-age features. Black et al. (1997) claim that burned rock midden use, while not as prevalent as in preceding periods, played an important role in the adaptive strategies of Toyah peoples.

Historical accounts of Native Americans and their interactions with the Spanish, the Republic of Mexico, the Texas Republic, and the United States throughout the region are provided by Bolton (1915), Campbell (1988), Campbell and Campbell (1981), Hester (1989), and Newcomb (1961). Collins (1995:386) divides this period into three subperiods. The first, beginning in the late seventeenth and early eighteenth centuries, marks an era of more-permanent contact between Europeans and Native Americans as the Spanish moved northward out of Mexico to establish settlements and missions on their northern frontier. There is little available information on aboriginal groups and their lifeways except for fragmentary data gathered by Spanish missionaries. Much of this sketchy evidence comes from the San Antonio and South Texas areas. Groups in these areas have been collectively referred to as Coahuiltecans because of an assumed similar lifestyle. However, many individual groups may have existed (Campbell 1988). The inevitable and disastrous impacts to native social structures and economic systems by disease and hostile encounters with Europeans and intruding groups, such as the Apache, were already under way at this time.

The second subperiod spans from the establishment of the mission system in the 1720s to its ultimate demise around 1800. Some indigenous groups moved peacefully into mission life, giving up their nomadic hunting and gathering way of life; others were forced in to escape the increasingly hostile actions of southward-advancing Apaches and Comanches. By the end of this time, many Native American groups had been decimated by European expansion and disease. Intrusive groups, such as the Tonkawa, Apache, and Comanche, moved into the region to fill the void. Few sites attributable to these groups, outside of mission sites, have been investigated. To complicate matters, many aboriginal lifestyles continued after Spanish contact. For example, the manufacture of stone tools continued for many groups even after settling in the missions (Fox 1979). The third subperiod, from 1800 to the last half of the nineteenth century, witnessed the final decimation of indigenous groups and the defeat and removal of the Apaches and Comanches to reservations by the United States.

While the chronologies of Prewitt (1981, 1985), Johnson and Goode (1994), and Collins (1995) all have merit, the latter is used in this report because it appears to be the most precise in terms of its radiocarbon-dated projectile point sequence. The one exception is that the Austin and Toyah phase names are retained as designations for the two subperiods of the Late Prehistoric period. These phase designations, which correspond precisely with Collins' (1995) Scallorn-Edwards and Perdiz style intervals, respectively, are retained and used in this report because they are very well defined and widely accepted by most researchers.

PREVIOUS ARCHEOLOGICAL RESEARCH AT FORT HOOD

The history of archeological investigations at Fort Hood has been discussed many times and is not revisited here. The reader is referred to Jackson (1994b), Trierweiler (1994b), and Trierweiler et al. (1995) for brief summaries of archeological investigations conducted in and near Fort Hood. Black (1989), Black et al. (1997), Collins (1995), and Ellis et al. (1994) provide the best background information for understanding the broader history of archeological method and theory in Central Texas archeology. Selected previous investigations in the Fort Hood area are summarized in Table 2.

PREHISTORIC RESEARCH CONTEXT AND NATIONAL REGISTER SIGNIFICANCE CRITERIA

Archeological work in Central Texas has come a long way since the inception of cultural resources management-related archeology after the passing of the National Historic Preservation Act of 1966, which established the National Register of Historic Places (NRHP). Significance testing for the NRHP was not rigorous during early archeological investigations at Fort Hood. By a process of trial and error over the past 30 years, evaluating sites for NRHP eligibility has become increasingly more formal, with a variety of research orientations, paradigms, and anthropological theories used at different times

Table 2. Summary of selected previous archeological research in and near Fort Hood*

Description of Work	Reference
Prehistoric site excavations in Bell County by A. T. Jackson, ca. 1933	Unreported, see Young 1988
Ranney Creek Cave site excavation, Coryell County, early 1930s	Unreported, see Prewitt 1974
Prehistoric site investigations by Frank H. Watt in the 1930s, including excavation of Aycock Rockshelter (or Kell Branch Shelter #1) in Bell County	Aynesworth 1936; Watt 1936; see also Stephenson 1985 and Lawrence and Redder 1985
Belton Reservoir preliminary survey by Robert Stephenson, late 1940s	see Shafer et al. 1964
Belton Reservoir survey and excavations, 1950s and 1960s	Miller and Jelks 1952; Shafer et al. 1964
Stillhouse Hollow Reservoir survey and excavations, early 1960s	Johnson 1962; Sorrow et al. 1967
Youngsport site excavations, Bell County, 1960–1962	Shafer 1963
Hog Creek Reservoir investigations by Southern Methodist University, early 1970s	Larson et al. 1975; Larson and Kirby 1976
Hog Creek Reservoir investigations by the University of Tulsa, 1977	Henry et al. 1980
Early surveys of Fort Hood by the Fort Hood Archeological Society, 1960s and 1970s	Thomas 1978
Initial CRM surveys of Fort Hood by Science Applications, Inc., late 1970s	Skinner et al. 1981; Skinner et al. 1984
CRM surveys of Fort Hood by the Texas Archeological Survey, University of Texas at Austin, early 1980s	Dibble and Briuer 1989; Dibble et al. 1989; Roemer et al. 1989
Historic research and remote sensing studies at Fort Hood, 1981	Jackson and Briuer 1989
CRM surveys and limited site testing at Fort Hood by Texas A&M University, 1980s–early 1990s	Carlson 1993c; Carlson et al. 1986; Carlson et al. 1987; Carlson et al. 1988; Carlson et al. 1994; Ensor 1991; Koch et al. 1988; Koch and Mueller-Wille 1989a, 1989b; Mueller-Wille and Carlson 1990a, 1990b; Thoms 1993
Analysis of military training impacts to archeological sites in West Fort Hood by Texas A&M University, 1981–1983	Carlson and Briuer 1986
Site testing at Fort Hood by Texas A&M University Field Schools, 1990, 1991, and 1992	Carlson 1993a, 1993b, 1997
Geoarcheological studies of Fort Hood by Texas A&M University, 1989–1992	Nordt 1992, 1993
Development of NRHP significance standards for prehistoric sites on Fort Hood by Mariah Associates, 1993	Ellis et al. 1994
Intensive shovel testing of 571 prehistoric sites by Mariah Associates, 1991–1993	Trierweiler 1994
Edwards chert patination study by Mariah Associates, 1993–1994	Frederick et al. 1994
NRHP prehistoric site testing by TRC Mariah Associates, 1993–1994	Abbott and Trierweiler 1995a

Table 2, continued

Description of Work	Reference
Archeological investigation of Native American medicine wheel by TRC Mariah Associates, 1994	Quigg et al. 1996
NRHP prehistoric site testing by TRC Mariah Associates, 1994–1995	Trierweiler 1996
NRHP prehistoric site testing by Prewitt and Associates, 1995	this report

*Some of the early investigations relate to an area approximately 100 km in diameter centered around Fort Hood, but most relate specifically to archeological investigations on the military reservation.

for measuring potential. Prehistoric sites are generally eligible for listing on the NRHP only if they meet Criterion D; that is, they have the potential to contribute information useful for answering research questions relevant to a research design. In recent years the archeological community has become more critical in deciding what the important research problems are for any given region and, more importantly, what types of archeological data are needed to address these problems. Prehistoric archeological research in Texas is slowly moving toward greater consistency through the development of regional historic contexts.

Fortunately, such a regional context has been developed for Fort Hood, making it easier for archeologists to make consistent assessments of prehistoric sites. In the early 1990s, Mariah Associates, Inc., conducted an intensive study aimed at developing a prehistoric research design for Fort Hood. In the resulting document, Ellis et al. (1994) determined that the simplistic cultural-historical perspective that has prevailed throughout the history of archeological research in Central Texas was not providing satisfactory results. Consequently, they created a new framework for evaluating NRHP eligibility of Fort Hood prehistoric sites that is both rigorous from a theoretical perspective and practical in terms of its implementation. This research design defines the ultimate goals of prehistoric archeological research at Fort Hood and establishes a set of NRHP significance standards as the new yardstick for judging the research potential of individual prehistoric sites. The Fort Hood research design defines four fundamental research domains that "address the basic issues which underlie archeological analysis" (Ellis et al. 1994:100). The research design takes the next step by identifying testable hypotheses that are categorized within a set of seven substantive research domains. These research domains, which are ordered from simplest to most complex, provide meaningful questions that may be addressed using basic archeological knowledge and data sets established by the fundamental research domains. The ultimate goal is to begin modeling adaptive behavior based on the premise (or null hypothesis) that the prehistoric inhabitants of Fort Hood employed a foraging strategy. The fundamental and substantive research domains for Fort Hood archeological research are summarized in Table 3.

Within the substantive research domains, a series of 19 testable hypotheses are proposed; the types of archeological data needed to address these hypotheses are defined, and the test implications that determine when each hypothesis is falsified are discussed. While these hypotheses, data needs, and test implications must be made explicit to define research goals, they are not practical for evaluating sites based on small amounts of archeological data obtained from limited testing. To bridge this gap, Ellis et al. (1994) boil down these research domains into a "Significance Model for Fort Hood," a series of questions that must be answered after each site is tested. These questions relate back to the fundamental research questions in that they define the types and quality of archeological data that a site possesses. Data needs questions that must be addressed through prehistoric site testing are:

1. Does the site (or subarea) have the potential to contain intact and undisturbed assemblages of artifacts and/or features?

Table 3. Summary of fundamental and substantive research domains for prehistoric archeological research at Fort Hood

Fundamental Research Domains	Chronological markers: • temporally diagnostic artifacts • geomorphic dating Paleoenvironmental research: • paleoclimate • paleotopography • paleoecology • paleoenvironmental synthesis	Subsistence bases: • flora • fauna Technological apparatus: • tool production • tool use • consumables in the technological system
Substantive Research Domains	1. Site function I: identifying the apparatus of subsistence and nonsubsistence technologies 2. Site function II: spatial organization of individual technologies 3. Stability and change in technology and subsistence 4. Identifying adaptations I: temporally specific arrays of technologies and subsistence resource bases 5. Identifying adaptations II: adaptive strategies 6. Fort Hood in regional context 7. Explaining adaptation and adaptive change	

2. Does the site (or subarea) have the potential to contain chronological indicators?

3. Does the site (or subarea) have the potential for stratigraphically separated (i.e., buried) deposits in primary context?

4. Does the surface assemblage have evidence of primary lithic procurement and/or lithic reduction activities?

5. Do currently available technical procedures allow temporal separation of unstratified palimpsest assemblages?

6. Does the site meet any or all of the key data needs to test cultural hypotheses? Presence or absence of key data is determined by the following questions:
   - Does the site contain prehistoric bone or shell specimens that can be identified and/or dated?
   - Does the site contain prehistoric macrobotanical specimens that can be identified and/or dated?
   - Does the site contain features that may contain economic and/or chronometric samples or which may imply economic activities?
   - Does the site contain multiple and spatially separated features?
   - Does the site contain burned rock features including middens or mounds?
   - Does the site contain unique, unusual, and/or nonlocal artifact types, artifact materials, concentrations of artifacts, feature types, or constellations of these?

The archeological research must address each of these questions, in order, for each site investigated. Questions 1, 2, and 3 assess contextual integrity; question 6 assesses content integrity. Questions 4 and 5 pertain to sites with surficial (or very shallowly buried) cultural evidence only and need not be considered for sites with buried cultural deposits. For a site with buried deposits, the answers to questions 1, 2, 3, and 6 must all be yes to meet the requirements for NRHP eligibility. If the answer to any one of these four questions is no, then the site is considered to have a fatal flaw and is deemed ineligible for listing on the NRHP.

The model of site significance proposed by Ellis et al. (1994) helps researchers identify

whether a site contains discrete, stratified layers of cultural occupation (or *gisements* as described by Collins [1996:374]). Archeologists must look for sites with sufficient context (i.e., containing stratigraphically discrete evidence of cultural occupation/use) and content (i.e., intact features, assemblages of associated artifacts, and datable and interpretable organic remains) to allow one to test hypotheses relating to cultural behavior. These types of archeological sites are worthy of being eligible for listing in the NRHP because they are likely to yield archeological data useful for addressing the prehistoric research problems identified for Fort Hood (Ellis et al. 1994:103–171).

METHODS OF INVESTIGATION

Steve A. Tomka, Gemma Mehalchick, Karl Kleinbach, and Douglas K. Boyd

4

The archeological research conducted by Prewitt and Associates (PAI) maintains consistency with the Fort Hood Cultural Resources Management Plan as defined by Jackson (1994a) and with previous prehistoric site investigations and archeological research conducted by TRC Mariah Associates (Mariah). PAI adopted many of the same field and analytical methods developed by Mariah in compliance with Fort Hood directives. Preexisting methods and procedures in four main areas were wholly adopted or only slightly modified. First, PAI continued using the research contexts and specific assessment criteria developed by Ellis et al. (1994) for evaluating NRHP significance (see Chapter 3).

Second, in terms of field implementation of the above-mentioned research design, PAI continued to employ the concept of "red flag" data sets. Mariah's lead was followed in conducting limited site testing designed to determine whether sites contain certain types of data that make them eligible for listing on the NRHP. The red flag data sets used by PAI were the same as those used by Mariah with one exception relating to human remains (discussed below). Testing was terminated at each site once evidence was sufficient to identify the presence of red flag data sets. This limited level of testing does not generate large samples of material culture and features, nor does it adequately address the problem of establishing site boundaries for extensive open sites. While this level of investigation is less intensive than typically employed for NRHP testing in Texas, it follows Fort Hood's Cultural Resources Management Plan philosophy of minimizing the costs of evaluating large numbers of sites.

Lithic analysis and the identification of material sources is the third area where long-term consistency is critical. Previous researchers had begun to recognize relationships between the geographic distribution of many distinctive varieties of Edwards cherts and their occurrence in prehistoric sites. Mariah developed a well-defined chert typology based on extensive field investigations and laboratory research using the lithic samples generated from NRHP testing of prehistoric sites. This chert typology was then systematically tested, ultimately proving that it has considerable utility as a research tool. Fort Hood is the largest chert-rich area in Central Texas where lithic sources have been examined thoroughly; thus, Mariah's work provides a substantial foundation for beginning to address a wide range of research questions relating to prehistoric utilization of lithic materials and group mobility on a large scale. PAI utilized the established chert typology (see Appendix E) as a baseline from which to begin its lithic material investigations.

Quality control for archeological field and laboratory investigations is the fourth area where continuity with previous research was maintained. PAI established its quality control program following the same basic procedures used by Mariah. Although some procedures and quality control forms were modified to more closely reflect the corporate structure of PAI, the quality control program is quite similar to Mariah's and results in a rigorous internal review of the consistency of archeological methods and data.

Each of these four topics is discussed in more detail in this chapter. In addition, this chapter summarizes the wide range of archeological methods and procedures utilized by PAI during its Fort Hood prehistoric site testing program.

IMPLEMENTING NATIONAL REGISTER SIGNIFICANCE CRITERIA: RED FLAG DATA SETS

The purpose of formal archeological testing was to assess the eligibility of 19 prehistoric sites for listing on the NRHP. Eligibility was evaluated according to the Fort Hood research design and the red flag site concept developed by Ellis et al. (1994). Red flag sites are identified as "sites which have a high probability of requiring further management attention" (Trierweiler 1994a:11). To implement NRHP significance criteria in the field, Mariah modified the red flag concept to include four red flag data sets. Any one of these sets, when encountered on a site-specific basis, immediately establishes a site as having a high research potential and as being eligible for listing in the NRHP. Abbott and Trierweiler (1995a:37) define the four red flag data sets as:

1. macroscopically visible organic remains (charcoal, bone, seeds, shell) in a primary, thin-bedded, and stratigraphically discrete context;

2. multiple and stratigraphically discrete cultural occupations with high chronometric potential as evidenced by abundant charcoal or hearths with fired substrates or in situ burned rocks;

3. human bone; and,

4. buried Paleoindian or Early Archaic components in primary and nondisturbed contexts.

PAI employed red flag data sets 1, 2, and 4 in precisely the same manner as previously used by Mariah. Red flag data sets 1 and 2 pertain directly to the issues of site content and context, as defined in the model of site significance for Fort Hood by Ellis et al. (1994) and summarized in Chapter 3. Red flag data set 4, however, was specifically implemented because the Fort Hood research design has identified the Paleoindian and Early Archaic periods as major data gaps.

PAI deviated from Mariah's previous methodology with respect to the use of human bones as a red flag data set. For our purposes, and at the request of the Fort Hood Cultural Resources Management Program, the definition of red flag data set 3 was modified to "human bones found in undisturbed stratigraphic contexts," (as opposed to human bones found in definitely disturbed contexts). The use of human bones as a red flag data set is discussed in more detail below, following a brief discussion of the overall level of effort for prehistoric site testing.

Level of Effort for Site Testing

Because the system of red flag data sets was employed, the overall level of effort for testing each prehistoric site was limited. The criteria of one or more of the three primary red-flag data sets (excluding human remains) were often satisfied by only a few test units. This is particularly true for the open sites in alluvial settings where, even upon inspection of backhoe trenches, it was obvious that test units would produce evidence of organic remains and cultural materials in primary contexts associated with one or more stratigraphically discrete cultural zones.

Each site was reviewed prior to conducting test excavations, taking into account recommendations of the original excavators when possible. Because the overall testing effort was limited by the specifications of the two delivery orders, various levels of site testing were determined by distributing the overall effort (i.e., the number of trenches and total volume of hand-excavated units) according to the perceived testing goals for each site. Recommended levels of effort were approved by Fort Hood with a great deal of flexibility to reallocate effort based on actual field findings. The actual work done at all 19 investigated sites was 41 backhoe trenches and 75 test units (Table 4).

Human Remains as a Red Flag Data Set

During Mariah's archeological testing program, Fort Hood's policy regarding Native American remains was to use the presence of any human bones in a site, regardless of archeological context, as a red flag that made the site eligible for listing in the NRHP. Prior to the PAI investigations, previous researchers followed Fort Hood's policy, which was "to assume that *any context* with human remains denoted site significance" (Abbott and Trierweiler 1995a:38). The policy, which came about after consultations

Table 4. Summary of work accomplished

Site	Site Type/Group	Backhoe Trenches	Test Units
41BL69	rockshelters	0	4
41BL155	other open site	3	5
41BL181	rockshelter	0	3
41BL579	rockshelters	0	4
41BL581	rockshelter	0	2
41BL582	rockshelters	0	3
41BL667	rockshelter	0	3
41BL816	other open site	2	3
41BL827	rockshelter	0	4
41CV722	other open site	5	12
41CV944	rockshelters	0	6
41CV1348	rockshelters	0	3
41CV1473	Leon River open site	2	4
41CV1478	Leon River open site	3	3
41CV1479	Leon River open site	3	2
41CV1480	Leon River open site	3	2
41CV1482	Leon River open site	4	3
41CV1487	Leon River open site	2	4
41CV1549	other open site	14	5

between the Fort Hood Staff Archeologist and the chairperson of the Reburial Committee of the American Indian Resource and Education Coalition, Inc. (AIREC), stated that all archeological work at a site (or in a specific subarea for larger sites) would be immediately terminated upon finding human bones. The policy further stipulated that when any human remains were discovered, the findings should be documented, all human remains and any associated cultural materials should be reinterred, and the excavation should be immediately backfilled. Abbott and Trierweiler (1995a:38) acknowledged that using human bones from disturbed contexts as a red flag was done for nonscientific reasons, primarily in response to the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA). In some cases, because of this policy, site testing was terminated before intact cultural deposits could be documented. The policy created a dilemma because it was difficult to evaluate a site for NRHP eligibility based solely on the presence of human remains, lacking evidence of intact cultural deposits.

During the time that PAI was conducting field investigations, the human remains policy was changed after another consultation between the Fort Hood Staff Archeologist and AIREC's Reburial Committee chairperson. The revised human remains policy established a compromise that would allow compliance with NAGPRA and at the same time provide a more realistic archeological approach in terms of evaluating NRHP criteria. The new policy (Dr. Jack Jackson, personal communication 1995) is identical to the old policy except that it permits continued excavation of test units "to seek undisturbed strata" where "scattered or displaced human bones" are found. When human remains are found in situ and articulated (i.e., an intact burial) or are encountered within an intact, stratigraphically discrete cultural deposit, the procedures are the same as for the previous policy.

Three different rockshelters at two sites were affected by the modified human remains policy. In two cases (Shelter A at 41BL69 and Shelter A at 41BL667), scattered human remains were encountered in obviously disturbed contexts (i.e., pothunter's backdirt), and excavations proceeded to the bedrock floor of each shelter. The finds were documented, but all human remains were reinterred in the test unit where they were found. In the third case (Shelter B at 41BL69), an in situ burial was encountered. Excavations in the shelter were immediately terminated, and the following procedures were observed: (1) the human remains were exposed sufficiently to determine that the find represented an articulated human skeleton within intact sediments; (2) the human remains were left in situ and documented; (3) all cultural materials from the unit were reinterred and the test unit was backfilled; and (4) the Field Supervisor notified the Project Manager and the Fort Hood Staff Archeologist of the discovery.

FIELD METHODS

Formal testing of the 19 sites consisted of backhoe trenching and/or manually excavated test units. Mechanical excavations could not be undertaken on any site prior to inspection of the area by a representative from the Fort Hood

Environmental Management Office, Natural Resources Branch (NRB). The purpose of this was to avoid impacting endangered species habitats or other protected areas. After checking site locations on Fort Hood military installation maps and corresponding aerial photo sheets and reviewing site sketch maps showing specific areas to be trenched, the NRB usually granted permission to proceed. In some cases, however, a field check by a NRB representative, accompanied by one of the archeological Field Supervisors, was necessary. Permission to conduct mechanical excavations was granted on all 11 open sites recommended for trenching. Typically, trenching was recommended solely on open sites. The talus associated with rockshelter 41BL827 was recommended for trenching, but it was not feasible for a backhoe to reach this site safely. Thus, 41BL827 was the only site recommended for mechanical excavations on which none were undertaken. In rockshelters, where only manual excavations would be conducted, permission to proceed was granted by the NRB regardless of the site's location since these excavations were not perceived as impacting the area. The one exception was a cave associated with Shelter B at 41BL579. It had been previously noted as potentially containing a bat colony, so it was treated as an environmentally sensitive area. After review by NRB staff, clearance was given and manual excavations were allowed in the cave.

Trenching on open sites was done for several reasons: to furnish exposures for interpreting depositional events; to assess site geomorphology; to prospect for buried cultural deposits; and to provide access to deeply buried components warranting manual excavation. The Directorate of Environment and Housing, Maintenance Division, Pavement Section at Fort Hood provided a backhoe and extremely proficient operators. At least one of the two Field Supervisors, and in some cases the Project Geomorphologist, always accompanied the backhoe operator to monitor the trenching effort. Trench placement was based on the results of shovel testing, past and present investigators' observations (such as cultural materials noted in exposures), and the need for adequate coverage of the site area. Although mechanical (and manual) excavations were typically conducted within previously delineated site boundaries, in some cases these boundaries were restricted to a small portion of a landform extending hundreds of meters in one or more directions. At times, these circumstances necessitated excavating trenches beyond a previously defined site perimeter. For example, based on the presence of cultural materials exposed in a cutbank and one positive shovel test at 41CV1482, trenches were excavated beyond the possible site boundary to more fully judge the site's potential significance. In no case was mechanical testing done specifically to establish site limits. The time and effort needed to conduct such a task are beyond the scope and goals of the current investigations.

All trench locations and dimensions were determined by the Field Supervisors in consultation with the Geomorphologist and/or the Project Manager. The trenches were numbered consecutively, and a wooden datum stake was placed next to the corresponding trench. The Field Supervisor noted trench locations on the site sketch map and recorded standardized information about each trench on a backhoe trench data form. When noting a trench's orientation, the long axis was recorded relative to magnetic north. Trench dimensions (length, width, and depth) were recorded in meters. The Geomorphologist profiled selected trench walls and described the strata on a geologic profile form. In cases where stratigraphic profiles were similar, only one or two trench profiles were recorded. All trenches were inspected by the field personnel for cultural remains. When appropriate, diagnostic artifacts and special samples, such as charcoal and bulk soil samples, were collected. Each sample was given a specific sample number consisting of the first letter of the sample type followed by a number. For example, the first charcoal sample collected from a site was designated C1, the first flotation F1, and so forth. All samples were assigned numbers and recorded on a sample inventory form.

Test units were excavated manually to sample buried cultural deposits, afford exposures for stratigraphic interpretation, and provide areal coverage of subsurface deposits across the site. Locations of test units were determined by the Field Supervisors in consultation with the Geomorphologist or the Project Manager. These decisions were contingent upon the trenching results, the previous investigators' observations, a general reinspection of the site area, and the results of shovel testing. In cases where a test unit was adjacent to a trench, the unit's orienta-

tion corresponded to that of the trench. Isolated units generally were oriented to magnetic north, although there were circumstances where a nonstandard orientation was more conducive to excavation (e.g., placement of units along the edge of a cutbank or pothole, or adjacent to the back wall of a rockshelter). Generally, test units measured 1x1 m or 50x50 cm, but the size sometimes varied slightly when units were excavated along a cutbank due to its gradient. Deviation from these standard sizes was most pronounced with test units paralleling a cutbank at site 41CV1487. Three units at this site measured 100 cm east-west but averaged only 30 cm north-south when excavations first began due to the slope of the cutbank; with depth, these units were enlarged to 1x1 m.

As with the backhoe trenches, test units were numbered sequentially, beginning with the next available number if previous test units had been excavated at the site. All test units were excavated in arbitrary 10-cm levels below the surface, with the ground surface at the highest corner of each unit used as the datum for elevation control. The only deviation was at site 41CV1487, where a single datum was established at the ground surface and the four units were located at various levels along the cutbank.

If a deposit was thoroughly vandalized and completely lacking integrity (as at site 41BL181), diagnostics were collected but the disturbed fill was removed and not screened. In addition, sediments of recent origin (i.e., the upper strata at 41CV1487) or sediments determined to contain no cultural deposits based on earlier test unit excavations, trench profiles, and cutbank exposures (such as at 41CV1480) were removed as overburden. Otherwise, all test unit fill was dry screened through ¼-inch-mesh hardware cloth. If present, samples of charcoal/diffuse ash and a maximum of 20 land snail shells, in addition to most cultural materials, were collected from each level. Cultural materials not collected include unmodified mussel shell fragments lacking hinges (presence noted), burned rocks (grossly sized, counted, and weighed), and intrusive historic and modern items (presence noted). An excavation record form was completed for each level, and an artifact frequency distribution summary form was filled out for every test unit. Selected profiles of test units, particularly those revealing features or cultural lenses in cross section, were drawn. If necessary for stratigraphic interpretation, isolated test units were described as geologic profiles by the Geomorphologist; this occurred occasionally at open sites and at all rockshelters.

Feature fill was excavated and removed as discrete provenience units irrespective of arbitrary levels, while nonfeature matrix surrounding features was removed according to arbitrary levels and screened separately. Exceptions include the large midden deposit (Feature 1) at 41BL155, which was completely excavated in arbitrary 10-cm levels, and a rock-filled pit (Feature 1) at 41CV1479, which was removed by individual rock layers. A feature data form was completed for each feature, and plan and profile views were drawn. Whenever possible, separate charcoal samples were taken. In many cases, all of a feature's matrix was removed as a flotation sample. The size of the flotation samples, contingent on the feature's size and type of fill, ranged from 1.25–23.5 liters. An average flotation sample consisted of ca. 5 liters. If only a portion of the feature was sampled, the remaining matrix was screened through ¼-inch-mesh hardware cloth. When special samples such as flotation or charcoal were taken from features, they were assigned specific sample numbers and listed on sample inventories. The Field Supervisor noted test unit locations on the site sketch map and recorded excavation progress on daily journal forms. When necessary, a general data form was used for recording additional excavation information or daily notes.

Whenever possible, test units were excavated to bedrock, abundant gravels, large immovable rocks, deposits that were not culturally relevant in age, or combinations thereof. This occurred on nine sites containing rockshelters and a cave. Site 41BL69, Shelter B was an exception in that all excavations ceased when an intact burial was encountered. Test units located on 3 of the 10 open sites encountered one of the aforementioned circumstances which halted excavation. Seven open sites, however, contained Holocene deposits greater than 3 m thick. At these sites, test excavations were terminated at an arbitrary depth at or below the maximum depth of cultural materials observed in trenches or other exposures.

Each site and its excavations were photographed and videotaped. Black-and-white print and color slide photographs were taken to document all phases of the investigations, including

site and area overviews, backhoe trench and test unit profiles, cultural features, and other unusual archeological remains. The documentation of site excavations on videotape fulfilled a contractual obligation required by Fort Hood.

Various mapping strategies were employed for constructing detailed maps of investigated sites or subareas. Seven of the 10 open sites were mapped with an optical transit, while a total station was used to map the 3 largest open sites (41CV722, 41CV1473, and 41CV1549). Mapping of sites concentrated only on subareas that were tested; other subareas were only partially mapped or completely excluded. At each open site, a permanent site datum marked by a rebar in the ground was assigned an arbitrary elevation of 100 m. All topographic data are relative to these datum points. Every site map includes the natural topography, cultural features visible on the surface, all mechanical and manual excavations, natural and manmade landmarks, a site boundary, and if applicable, subarea demarcations. The Geomorphologist drew cross sections of open sites depicting the various geomorphic surfaces and associated depositional units. Plan views and profiles of each rockshelter were drawn using tapes, compasses, and line levels. Larger open shelters and the surrounding area also were mapped with an optical transit, following the same procedures as for open sites. New maps were constructed and preexisting ones were modified. Each shelter plan view includes all test units, the talus edge and slope, the dripline, rock outcrops, and disturbed areas (particularly those resulting from vandalism). A large nail in the floor or back wall of each shelter was designated as the shelter's datum. Since the cave associated with Shelter B at 41BL579 contained historic and modern graffiti, these etchings were mapped relative to their locations on the wall, in addition to being photographed and videotaped. A plan view and a profile were drawn of the cave's interior.

During the course of the test excavations, records and maps were reviewed by the Field Supervisors for consistency and quality. As the fieldwork was finished for each site, a site testing summary and checklist were completed to provide an overview and serve as a double check for identifying possible inconsistencies. Records were periodically reviewed by the Project Manager and the Quality Control Officer (see Quality Control below).

The final field task consisted of backfilling all test excavations. Each trench and all accessible test units on open sites were filled in by the backhoe. An archeologist accompanied the operator and monitored the process. All excavations in rockshelters and test units that could not be reached by the backhoe were backfilled manually by the archeologists.

Once fieldwork was completed, the Field Supervisor who oversaw the test excavations, along with the Geomorphologist, wrote a preliminary site report for each of the 19 tested sites. These reports were then reviewed by the Project Manager and subsequently submitted, along with corresponding attachments and videotape, to the Fort Hood Staff Archeologist. Specific information regarding the methods used by the Project Geomorphologist for describing geological profiles is found in Appendix B.

LABORATORY METHODS

Before fieldwork began, a thorough review was made of the methods and standards required by the Fort Hood Cultural Resources Management Program for laboratory processing and curation of the collections from the two delivery orders. All artifact and material collections also were processed and curated according to federal curation guidelines, Council of Texas Archeologists (CTA) standards, and current curation and conservation standards. A Laboratory Manual was created to outline the procedures to be used and the standards to be met.

All of the collections were organized, processed, and curated by site. Collections from different sites were never intermingled at any stage of the lab processing. As artifacts were brought in from the field, they were organized by project and provenience and checked for any problems or inconsistencies with the provenience information. If a problem was noted, it was corrected by referring to field records or consulting with the field crew. Collection bags were also checked to see if any special information/instructions had been given. These cases were set aside to be dealt with as needed and with the appropriate methods.

Once the field bags were checked, the materials were taken to the wet lab for cleaning. The artifacts were removed from the bags and checked for artifact type to determine appropriate cleaning methods. Some artifact categories,

such as bone, charcoal, and vegetal matter, were finger- or dry-brushed rather being cleaned with water. Other artifacts were cleaned using tap water and occasionally a soft toothbrush. After cleaning, artifacts were placed on a drying rack and allowed to thoroughly air dry before being cataloged. For some of the lithic materials, it was necessary to remove adhering deposits that would hinder analysis. This was done using a 5 percent solution of hydrochloric acid in water. Each artifact was soaked for 10 minutes in clear tap water are then soaked in the HCl solution till the majority of the effervescence ceased. The artifact was then soaked in clear tap water for at least 30 minutes to remove any remaining acid from the lithic surface. A list of the artifacts that received this treatment is included in the records.

The artifacts were then bagged by material type within provenience designation. Each group of provenienced artifacts was assigned an accession number, which is a unique provenience-specific number. A specimen inventory, organized by site and in accession number order, was compiled with each artifact type listed under its assigned accession number. Recorded on the specimen inventory were the accession number, associated provenience data, the name of the excavator(s), the date of excavation, any other information recorded on the field bag, and the type and quantity of artifacts recovered. For some material categories, such as charcoal, a weight (usually in grams) was recorded rather than a count.

All categories of artifacts were cataloged with the site number and accession number. Lithic tools also were assigned unique specimen numbers within each accession number. When assigned, this number was added after the accession number on the artifact. Artifacts that were cataloged received a base coat of PVA (a 10 percent solution of Polyvinyl Acetate Resin-AYAT in acetone). When dry, the site, accession, and specimen numbers where recorded using a rapidograph pen. This catalog number was then covered with a top coat of PVA.

Each artifact type was placed into a 4-mil polyethylene ziplock bag. Archival curation tags documenting the name of the project, project number and date, site number, provenience data, accession number, artifact type, and the number of specimens (or weight) were placed into 1.5-mil polyethylene bags and placed within each artifact bag. Artifacts were grouped by overall artifact type, unless specific subtypes were delineated. For example, projectile points were bagged by type name rather than as one unit.

Like the artifact collections, all of the photographic materials were organized by project and site. Black-and-white photographs and negatives were checked against the photo logs to ensure that frame numbers and captions correlated and that the recorded information was accurate. The contact sheets were labeled on the back with project number, site number, photo number, roll number, and frame number. The negatives were labeled with project number, site number, and photo number. A 4x5-inch print was made from each negative; these also were labeled with project number, site number, photo number, and caption. Color slides were checked against the photo log to ensure that the frame numbers and captions correlated and that the recorded information was accurate. Each slide was labeled with project name and number, site number, slide number, and caption. All of the photographic materials were placed into the appropriate archival holders. Videotapes of site investigations were labeled with project name and number, site number, and appropriate provenience information.

All records used in the field and the lab were printed on archival paper and filled out in pencil. The exception to this were maps drawn on nonarchival grid paper; these were later treated in the lab with a deacidification solution. All field, lab, and analysis records were organized by project and then by site. Records were grouped by categories such as daily journal notes, testing forms, feature forms, specimen inventories, etc. The only exception is that all photographs were curated as a unit, with all of the black-and-white photographs together and all of the color slides together. All written and photographic materials were placed in archival folders, archival record boxes, and archival curation boxes. An inventory detailing contents was included with each curation box. Curated photographic records also contain a computer-generated copy of the photo log, a cross-referenced photo log organized by site, and a disk copy of the computerized photo logs.

ANALYTICAL METHODS

Analyses of material culture (see Chapter 7)

varied considerably depending upon the class of artifact being analyzed, the number of specimens within each artifact class, and the specific goals of the analysis of each class. Because many artifact classes consist only of a few specimens, these artifacts, such as items of worked bone (n = 3) and shell (n = 7), are described individually and any special treatments or analytical procedures employed are discussed on a case-by-case basis. Analysis of the ubiquitous stone artifacts, however, involved the use of a formalized functional/morphological classification scheme and systematic observations of selected attributes for different types of artifacts. The remainder of this section deals with the analysis of chipped, ground, and battered stone artifacts.

The preliminary inventory of lithic artifacts collected from the 19 sites divided the specimens into two broad analytical categories: chipped stones and ground/battered stones. Within the chipped stone category, the largest single class is unmodified debitage. Except for this debitage, all chipped and ground stone artifacts were subjected to a full attribute analysis, described below. Two levels of analysis were employed for unmodified debitage. Because debitage was so abundant and its analysis so time consuming, a decision was made to concentrate much of the analysis effort only on debitage samples derived from meaningful archeological contexts. Thus, only debitage from definable components or occupations (i.e., analysis units of known time periods) from sites deemed to be worthy of listing in the NRHP was subjected to a full attribute analysis. Unmodified lithic debris samples derived from undefinable or poorly defined components at NRHP-ineligible sites were subjected to a limited analysis involving only a selected set of attributes. The goals of the limited debitage analyses were to provide basic information of raw material procurement strategies and to maintain continuity with previous lithic analysis studies by Mariah.

In general, the stone artifacts were divided into artifact categories based on morphological criteria, functional criteria, or a mix of the two (Table 5). Morphological classifications (i.e., biface, uniface, etc.) divide assemblages into categories and/or subcategories based on such criteria as similarities in outline shapes, method of manufacture, and location of working edges. The actual uses of these artifacts are implied but do not serve as the primary organizing criteria. The reader has to derive tool use from the descriptions of the categories, which often lack discussions of microwear evidence, to reconstruct the range of activities carried out by prehistoric peoples at the sites being investigated. The cornerstone of functional classifications is identification of the actual use of the artifacts being studied and their classification based on tool use rather than morphology (i.e., knives, scrapers, gravers, choppers, etc.). By necessity, such classifications place a great deal of burden on microwear analysis and are somewhat complicated by the classification of multiple-use tools. Nonetheless, the resulting tool classes are more readily usable in reconstructions of site use, assemblage composition, and technological organization. Most often, lithic analyses divide assemblages into categories and subcategories that crosscut both morphological and functional criteria (i.e., projectile points, drills, bifaces, and unifaces). In these cases, careful thought given to the analytical criteria used in classification can help clear up most of the unnecessary classificatory overlaps and provide data of greater utility for archeologists interested in reconstructing the past rather than just cataloging and describing artifact collections. Although the classification of artifact assemblages based on functional criteria does diverge from previous lithic analyses of Fort Hood assemblages, it is used for this study because of its interpretive utility.

Chipped Stone Artifact Categories

Projectile points are unifacially and/or bifacially flaked stemmed specimens with a triangular to leaf-shaped blade segment, a sharply pointed distal end, and sharp lateral blade edges. In many cases, they have a barbed or shouldered proximal blade portion.

Artifacts with relatively long and narrow, usually bifacially flaked, blades characterized by a diamond- shaped biconvex or planoconvex transverse cross section and exhibiting use-related microflaking on either both faces of each edge or on alternate faces of opposite edges and polish and rounding on the body of the blade are classified as perforators. Bifacially flaked specimens characterized by planoconvex and more often biconvex transverse and longitudinal cross sections, straight to slightly convex and

Table 5. Functional-morphological classification of stone artifacts

Chipped Stones

Projectile Points

- Arrow Points
  - named type
  - untyped (various morphological categories)
  - untypeable
- Arrow point preform (of named type)
- Arrow point blank (untypable)

- Dart Points
  - named type
  - untyped (various morphological categories)
  - untypeable
- Dart point preform (of named type)
- Dart point blank (untypeable)

Perforators
- Drill*
- Reamer*
- Indeterminate*

Knives*

Scrapers
- End scraper*
- Side scraper*
- End/side scraper*
- Spokeshave*
- Spokeshave/end scraper*

Gravers*

Adzes
- unifacial*
- bifacial*
- indeterminate*

Gouges
- unifacial
- bifacial

Choppers

Wedges

Miscellaneous Bifaces
- manufacture Broken*
- unfinished Manufacturing Failure*
- bifacially Flaked*
- other Biface*
- biface Edge Fragment*

Miscellaneous Unifaces
- unfinished Flaked Tool Edge*
- indeterminate Fragment*
- unifacially Flaked*

Multifunctional Tools
- Knife/end scraper*
- Knife/side scraper*
- Knife and end/side scraper*
- Graver/end scraper*
- Graver/side scraper*
- Graver and end/side scraper*
- Perforator/end scraper*
- Perforator/side scraper*
- Perforator and end/side scraper*
- Spokeshave/graver*

Cores

Unmodified Debitage
- biface reduction flake
- biface thinning flake
- biface resharpening flake
- notching flake
- platform or core preparation flake
- uniface manufacture/resharpening flake
- macroflake
- blade blank
- indeterminate

Ground and Battered Stones

Manos

Metates

Hammerstones

Indeterminate

* Further classified into two or more of the following categories: formal, minimally retouched, expedient, formal/minimally retouched, minimally retouched/expedient, and indeterminate.

moderately beveled working edges, and polish and rounding of protruding flake scar ridges on both faces of the tool and microflaking primarily on the ventral face are categorized as adzes. The specimens grouped into this category often exhibit haft wear on both faces of their proximal ends. Unresharpened portions of the working edges exhibit moderate to considerable

rounding and polish, while the unbeveled faces of the working edges often contain step-fractured microflake scars. Both faces of heavily worn specimens retain a considerable amount of polish and rounding of the flake scar ridges well behind the working edge. The working edges are straight to moderately convex but never concave, and resharpening is present on both the ventral and dorsal faces of the blades.

Triangular and/or trapezoidal unifacially or bifacially flaked specimens with planoconvex transverse and longitudinal cross sections, straight to concave steeply beveled working edges, and use polish concentrated primarily on the ventral face of the tool are classified as gouges. The distribution of use wear, in the form of heavy polish and microflaking on the ventral surface, indicates that gouges were used in a manner similar to modern-day planes.

Knives are tools with acute working edges, with or without unifacial and/or bifacial retouch, exhibiting use wear in the form of scalloped working edges on unmodified flakes (i.e., expedient knives) and flake scar ridge rounding, polish, and striations parallel to the longitudinal axis on both faces of unifacially and bifacially flaked working edges. Given that no differentiation is made regarding the material being worked and that the use wear describes primarily the manner of tool use, this functional category includes knives used in meat processing as well as saws and sickles used for processing vegetal materials.

Unifacially flaked artifacts (including a few specimens with minimal bifacial flaking along either the working edge or the proximal end) and unretouched flakes characterized by relatively acute working edges, often exhibiting unifacially distributed microflaking and more commonly edge rounding on either distal and/or lateral working edges, and with or without modification for hafting are classified as scrapers. Although most unifacially flaked gouges also fit this description with the exception of the working edge angle, they are distinguished from the scrapers based on the differential distribution and extent of use wear derived from differences in use. Tools with use-related microflaking on the dorsal face of the working edge are classified as scrapers, while specimens that exhibit use wear primarily on the ventral face of the working edge are classified as gouges.

Cobbles retaining a cortex-covered surface opposite a unifacially or bifacially flaked working edge and having an edge with substantial crushing, step fracturing, and/or rounding are classified as choppers. Specimens that have been intentionally retouched to form a point or projection and minimally retouched specimens that have naturally occurring or incidentally formed sharp projections that exhibit use wear in the form of polish and micro-burin scarring are classified as gravers. This functional category includes flakes with naturally occurring and/or minimally flaked short beaklike projections employed in graving tasks as well as tools such as projectile points, bifaces, and other potential functional categories that retain utilized sharp projections derived from purposeful reworking, use, or manufacture breakage.

Unmodified debitage consists of the byproducts of core preparation and reduction and tool manufacture, rejuvenation, and reworking. It includes all flakes and flake fragments that have not been retouched into previously mentioned tools and/or have not been utilized in an unretouched form as expedient tools.

Bifacially flaked tools and tool fragments that were broken in manufacture and/or have use wear that could not be classified into any of the previously described functional categories are classified as miscellaneous bifaces. These tools are too fragmentary, were broken before being finished, or have ambiguous use wear indicators. Similarly, unifacially flaked tools and tool fragments that were broken in manufacture and/or have use wear that could not be classified into any of the previously described functional categories are classified as miscellaneous unifaces.

A number of morphological and/or typological subcategories are employed in the classification of projectile points, perforators, adzes, gouges, knives, scrapers, gravers, and multifunctional tools. These subcategories represent divisions based on differences in mode of propulsion (i.e., among projectile points), similar tool uses but morphologically distinct end products (i.e., among perforators), different degrees of effort expended in tool manufacture (i.e., bifacially flaked vs. unmodified tools), or differences in the location of the tool's working edge on the parent material (i.e., end vs. side scrapers).

Projectile points are divided into arrow points and dart points. Generally, specimens weighing less than 2.2 g and having a maximum

thickness less than 6 mm and a maximum neck width less than 11 mm are classified as arrow points. With few exceptions, projectile points exceeding these dimensions are classified as dart points. In addition to these subcategories, all projectile points are categorized into the regional typology (Suhm et. al. 1954; Turner and Hester 1993) by Elton R. Prewitt. The estimated age(s) assigned to selected point types and the assignment of points to archeological eras and subperiods throughout this report are based on the recently published revision of Central Texas chronology (Collins 1995). This revision redefines the duration of eras and reassigns selected point types within these eras. For point types not mentioned in Collins (1995), Suhm et. al. (1954), or Turner and Hester (1993), the age, archeological era, and subperiod assignments are based on chronological placement by Prewitt (1981, 1985). Manufacture-failed arrow and dart points that have sufficiently complete or well finished stems to be classified by type are considered preforms of the appropriate type. Manufacture-failed points broken so early in the manufacture sequence that their stems were not yet formed are classified as blanks. Projectile points that could not be confidently classified by type are grouped into morphological groups and subgroups based on stem and base morphology (e.g., untyped expanding stem/straight base, untyped expanding stem/convex base, etc.). Points with two broken ears do not allow the reconstruction of the stem shape and are classified as untypeable. Use-broken points lacking features allowing their placement into typed or untyped point subgroups also are classified as untypeable.

Perforators are divided into two subcategories based on the stage at which the tools were employed in a sequence of activities. Drills are specimens with sharp tips and narrow blades and are assumed to have been used to perforate materials. Reamers are perforators with wider, more-rounded tips and broader blades; they are assumed to have been used to enlarge existing holes. Based on the degree of retouch employed in their manufacture, each drill and reamer is further subdivided into three subcategories: (1) formal, (2) minimally retouched, and (3) expedient. Specimens with bifacially flaked blades and stems are considered formal. This group may contain a variety of forms, including flakes with bifacially chipped blades and stems, as well as projectile points and/or bifaces reworked into perforators. Perforators made on flakes and exhibiting bifacial flaking only on the blade are classified as minimally retouched. Flakes with a fortuitous sharp protrusion employed as a perforator without prior retouch are considered expedient perforators.

Based on the degree of effort invested in their manufacture, specifically flaking, adzes are divided into the two subcategories formal and minimally retouched. Formal adzes are unifacially and often bifacially flaked specimens that represent systematic shaping of the blank, are characterized by thin to moderately thin cross sections, have well-patterned and shallow flake removals, and have well-aligned edges. Primarily unifacially (but sometimes bifacially) flaked specimens that are less well defined in outline shape, are less extensively flaked, and have deep irregularly spaced flake removal scars are classified as minimally retouched adzes. Adze fragments that are too small to determine whether they were unifacially or bifacially flaked are grouped into an indeterminate category.

Gouges also are divided into two morphological subcategories, formal and minimally retouched, based on degree of retouch. The first group consists of unifacially and/or bifacially flaked gouges made through systematic flake removals. During manufacture, considerable attention was paid to shaping the overall outline. Flake scars are shallow and well patterned rather than deep and haphazard, and the working edge is carefully flaked. In the case of the minimally retouched specimens, the rather haphazard and minimal shaping of these blanks was accomplished through the removal of flakes by hard hammer percussion. Considerably less attention was paid to shaping the working edge and overall outline.

Knives are divided into four subcategories based on degree of effort invested in their manufacture. These are (1) formal, (2) minimally retouched, (3) expedient, and (4) minimally retouched/expedient. Specimens that are bifacially flaked to the degree that the original shape of the parent material is totally altered are considered formal knives. These specimens might still retain a portion of the parent flake blank's ventral surface, but they are bifacially flaked along most or all of their circumference. Also included in the formal subcategory are blades exhibiting extensive unifacial flaking that

extends onto the dorsal face of the tool and normally results in some reshaping of the blade's original margin(s). Items with irregular unifacial and/or bifacial flaking distributed sporadically along the margins of the parent material are considered minimally retouched. Blades and/or flakes with no retouch subsequent to their removal but exhibiting use wear derived from the performance of cutting/slicing activities are considered expedient knives. Finally, knives with separate working edges exhibiting minimal retouch and modification derived from use are categorized as minimally retouch/expedient knifes.

The scrapers are grouped into the same subcategories as the knives: (1) formal, (2) minimally retouched, (3) expedient, and (4) minimally retouched/expedient. Marginal retouch evident on formal scrapers is extensive and usually results in changes in the outline shape of the blank on which the tool is manufactured. Minimally retouched scrapers are unifacial tools with minimal retouch or modification. Generally, the overall shape of these items is minimally altered from the original form of the blank, and working edges are very short and irregularly flaked. Expedient scrapers consist of unmodified debitage that was utilized in the performance of scraping tasks without prior or subsequent modification of the working edge. As a result, the edge modification observed on these specimens derives solely from use. Individual scrapers exhibiting a combination of minimally retouched and unretouched, use-worn working edges are in the minimally retouched/expedient scraper category.

Scrapers are divided into three subgroups based on the location of edge retouch and working edge use wear: end scrapers, side scrapers, or combination end/side scrapers. In classifying a tool as an end or side scraper, the specimen is oriented parallel to the direction of force in which the parent flake was removed from the core. For example, specimens with use wear and modification on the distal end of the parent flake are classified as end scrapers. Scrapers on which the direction of force cannot be determined are classified based on the location of the modification relative to the long axis of the specimen. Specimens with retouch and use wear on the short edges or distal ends are classified as end scrapers, while scrapers with use wear and flaking along the longer edges or sides of the parent flake are classified as side scrapers. Scrapers with flaking and use wear along both the distal and lateral edges are classified as combination end/side scrapers.

Artifacts or tools that have experienced two or more uses as a result of recycling are categorized according to their last functional role. For instance, a projectile point reworked into a perforator is classified and discussed under perforators rather than projectile points; however, a mention is made of the fact that the specimen is a reworked projectile point.

Artifacts or tools that appear to have been used for the performance of two or more functionally distinct tasks or have two or more functional working edges are classified as multifunctional tools. They differ from the above-mentioned recycled tools in that multifunctional tools might have been used in a variety of tasks without reworking the working edges of the tool.

Ground and Battered Stone Artifact Categories

Small- to medium-sized oval to rounded quartzite and/or sandstone nodules exhibiting smoothing, polish, and/or pecking are considered manos. Medium to large tabular limestone and/or sandstone specimens with a shallow to deeply concave surface exhibiting an even, smooth surface, often accompanied by polish and pecking derived from grinding and surface rejuvenation, are classified as metates. Tool fragments with one or more surfaces exhibiting smoothing, polish, and/or pecking, but too small to be identified as manos or metates are classified as unidentified ground stones. Small to medium oval to rounded nodules exhibiting concentrated areas of crushing and pitting on their ends, around their circumference, and/or on their flat surfaces, with parallel striations usually concentrated on their flat surfaces and small areas of smoothing on both faces, are classified as hammerstones.

Analysis Attributes

Raw Materials and Chert Typology

Five raw material types were identified among the chipped, battered, and ground stone artifacts. These are (1) fine-grained chert,

(2) coarse-grained chert, (3) fine-grained quartzite, (4) limestone, and (5) sandstone.

Specimens identified as fine-grained chert consist of opaque to partially translucent cryptocrystalline or microcrystalline materials. Cherts that lack visible crystalline structure, have weak to moderate luster, and are partially translucent are categorized as fine grained. Cherts with visible crystalline structure, opaque appearance, and a generally grainy fill are considered coarse grained. However, in the Fort Hood chert typology, many of the so called fine-grained specimens contain inclusions and quartzite pockets that, when sufficiently large, can give a piece a coarse-grained appearance. Quartzites are metamorphic rocks consisting mainly of recrystallized quartz (Bates and Jackson 1984:414). The majority of the specimens recovered are characterized by fine-grained crystalline structures and a reddish purple color. Materials formed of fine- to coarse-textured sand grains cemented by silica and/or carbonates are categorized as sandstone.

Given the importance of Fort Hood and its vicinity as a resource area that supplied prehistoric peoples with abundant cherts for local and extraregional use (Shafer 1993:55), a great deal of attention has been devoted to the development of a typology of the chert resources present on the installation (Abbott and Trierweiler 1995b; Dickens 1993a, 1993b; Frederick and Ringstaff 1994). The current Fort Hood chert typology consists of 27 distinctive types of chert and is summarized in Appendix E.

Tool/Debitage Morphology

Three attributes are used to characterize tool/debitage morphology: (1) completeness, (2) stage of manufacture, and (3) manufacture technique. Completeness is recorded for all tools and unmodified debitage. Fragments of projectile points, perforators, adzes, gouges, knives, scrapers, choppers, wedges, gravers, multifunctional tools, miscellaneous bifaces, and miscellaneous unifaces are classified into one of the following categories: proximal, medial, distal, and longitudinal fragments; triangular wedges; edges; and barbs. All tools with intact proximal and distal ends and lateral margins are considered complete. Tools with intact proximal ends and missing distal blade portions are considered proximal fragments. Tool fragments with missing distal and proximal portions but preserving a midsection of the specimen are classified as medial fragments. Tools with intact distal ends and missing proximal portions are considered distal fragments. Tools missing one longitudinal edge but retaining identifiable distal and proximal ends are classified as longitudinal fragments. Triangular edge fragments that usually derive from the medial portions of tools are classified as triangular wedges, while longitudinal portions of tool edges are simply considered edge fragments. Arrow and dart point barbs are classified as barb fragments. In addition to these main types, projectile point fragments representing only the stem or hafted portion of the tool (i.e., broken at or below the neck) are classified as stem fragments. Given the larger number of metric attributes recorded on projectile points, a more detailed explanation of their completeness categorization is necessary. Projectile points with broken barbs and broken ears are considered complete as long as the maximum length of the specimen can be measured. Projectile points with broken blade tips that were subsequently reflaked into a new tip are considered complete as long as only 1 mm or less of the original break face remained unflaked (e.g., they were reworked into functional specimens). Projectile points with blade reworking that left more than 1 mm of the original break face unreduced are considered nonfunctional and as a result are grouped into the appropriate fragment category.

Four unmodified debitage (flake) completeness categories were distinguished: (1) complete, (2) proximal, (3) chip, and (4) chunk. Complete flakes retain both a striking platform and a feathered and/or hinged termination. Proximal fragments have only a platform and lack feathered and/or hinged distal ends. All medial and distal flake fragments are classified as chips. Angular debris lacking clear flake features is placed in the chunk category.

To gauge the stages of manufacture represented in the collection, projectile points and miscellaneous bifaces are divided into stages of manufacture. The projectile points are subdivided into finished specimens, preforms, and blanks. All complete projectile points exhibiting no technological or morphological characteristics that would have impeded their proper functioning are considered finished. All fragmentary specimens broken in use that would have been functional prior to breakage also are considered

finished. Complete arrow points and dart points that never reached a functional state and specimens broken during manufacture are grouped into a preform category as long as their proximal ends exhibit evidence of stem manufacture. Only specimens that could be assigned to a particular arrow or dart point type are considered preforms (i.e., preforms of that particular type). Fully or partially bifacially flaked specimens that are complete and lack use wear or that are manufacture-broken fragments judged to be of the appropriate size and flaking quality to be made into projectile points are considered either arrow or dart point blanks depending on their size.

Miscellaneous bifaces are subdivided into early, middle, and late reduction stage specimens. Bifaces with highly sinuous edges, few flake removals, corticate surfaces, and/or thick cross sections are considered early reduction stage. Specimens lacking deep flake scars, pronounced flake scar ridges, and cortex but exhibiting some patterning in flake removals and attempts to shape the core and/or flake blank are considered middle reduction stage bifaces. Relatively thin bifaces with well aligned edges exhibiting pressure flake scars and a substantial degree of shaping are considered late reduction stage specimens. Recognizing that many chipped lithics might have been employed in the performance of certain tasks even if they had not reached a late reduction stage, bifaces with use and/or haft wear are categorized as finished or functional specimens regardless of reduction stage criteria.

Manufacturing technique refers to the location (unifacial or bifacial) of the flake removals employed in tool manufacture. The three subcategories recognized are unifacial, bifacial, and indeterminate. Specimens made by the removal of flakes from only one face of the parent material (dorsal face of tool) are considered unifacial. Specimens that fit this description but also have a few flake removals off the second face of the tool (ventral face of tool), primarily intended to thin the bulb of percussion located at the proximal end, are still considered unifacial. Tools made by flaking both the dorsal and ventral surfaces are considered bifacial. Tool fragments too small to determine whether they are unifacially or bifacially flaked are grouped in an indeterminate category.

Core/Blank Characteristics

The two attributes included in this group are the number of flake removal scars and the nature of the blank used in tool manufacture. The first attribute consists of the count of flake scars not resulting from platform crushing and gauges the number of flake removal scars present on complete cores. Platform preparation scars 1 to 10 mm in length also are excluded. The second attribute refers to the nature of the blank used in tool manufacture. It consists of the following states: (1) pebble/nodule, (2) flake, (3) blade, (4) arrow point, (5) dart point, (6) biface, (7) uniface, and (8) indeterminate. The first three categories are used to designate artifacts made from naturally occurring materials and/or flakes and blades removed from them. On the other hand, tools that represent the reworking of recycled artifacts were classified as made on one of four blank types (categories 4–7) (e.g., a drill made on a dart point). Finally, tools for which the nature of the blank could not be established were categorized as indeterminate. Blank characteristics were recorded for perforators, adzes, gouges, knives, scrapers, wedges, gravers, miscellaneous bifaces, and miscellaneous unifaces.

Cause of Fracture

This attribute identifies the cause of fracture for incomplete projectile points, perforators, adzes, gouges, knives, scrapers, choppers, wedges, and miscellaneous bifaces. The four causes of fracture distinguished are (1) use, (2) manufacture, (3) postdepositional, and (4) indeterminate. Some use-generated breaks and a large variety of manufacturing breaks have been reproduced experimentally (Tomka 1986). Others are taken from studies of manufacture and use-generated tool failures (e.g., Callahan 1979; Crabtree 1972; Johnson 1979, 1981; Muto 1971; Odell and Cowan 1986). The diagnostic morphologies defined from these replications are the comparative bases used in identifying fracture causes on the archeological specimens. Break morphologies that share characteristics of more than one cause of fracture or that were not replicated experimentally were assigned to an indeterminate category.

Although a typology of break morphologies for unifacial tools has not been developed, break cause also was identified on unifacially flaked artifacts (i.e., scrapers), as well as unretouched expedient tools (i.e., expedient knives and scrapers). Since the goal of differentiating break cause is to separate the finished, potentially functional,

and used artifacts from the unfinished specimens, each artifact fragment was examined for microscopic evidence of use and/or haft wear. Fragments with either of these wear types are considered broken in use, while fragments lacking these characteristics are considered broken in manufacture. Fragments of expedient knives and scrapers are, by definition, classified as broken in use even though postdepositional breakage may have occurred.

Size

Nine size measurements are included under this category: (1) maximum length, (2) maximum width, (3) maximum thickness, (4) maximum dimension, (5) blade length, (6) blade width, (7) base width, (8) neck width, and (9) stem length. Maximum length, maximum width, and maximum thickness are measured on complete specimens and fragments with appropriate intact portions. Blade length, blade width, base width, neck width, and stem length are measured only when the appropriate portion of the artifact is complete. In all of the artifact categories, only measurements taken on complete specimens or complete portions of fragmentary artifacts are used in the data statistics.

Eight maximum dimension categories are employed to categorize unmodified debitage into gross size classes: (1) <0.25 inch; (2) 0.25–0.38 inch; (3) 0.38–0.50 inch; (4) 0.50–0.75 inch; (5) 0.75–1 inch; (6) 1.0–1.5 inches; (7) 1.5–2.0 inches; and (8) >2.0 inches. These size categories were chosen for two reasons. Since they represent gradually increasing nested screen sizes, they allow the processing of large quantities of debitage within a minimum amount of time. These size categories are identical with those used in previous analyses of unmodified debitage carried out by Texas A&M and Mariah. All complete flakes and flake fragments were size graded according to this system.

Cortex Characteristics

The presence/absence and amount of cortex were recorded on both chipped lithic tools and unmodified debitage. The presence or absence of cortex was recorded for all chipped lithic tools other than projectile points and perforators. On complete expedient and minimally retouched tool forms, cortex was recorded in three categories: (1) primary, (2) secondary, and (3) tertiary. Specimens with 100 percent dorsal cortex coverage are considered primary. Specimens with cortex covering between 1 and 99 percent of the dorsal faces are categorized as secondary. Entirely decorticate (0 percent) specimens are considered tertiary. Incomplete expedient, minimally retouched, and formal tools with some cortex on their dorsal faces are grouped into a cortex present category. Entirely decorticate varieties of these same tool fragments are grouped into an indeterminate cortex category since cortex presence or absence on the original complete specimen cannot be determined. Complete formal tools with cortex on their dorsal surfaces are grouped into a cortex present category, while those without dorsal cortex are grouped into a cortex absent category.

The amount of dorsal cortex on unmodified debitage was recorded in four increments: 0 percent, 1–50 percent, 51–99 percent, and 100 percent. These increments are used in the classification of both complete flakes and flake fragments. The corticate or decorticate nature of the striking platform did not enter into consideration when classifying specimens into these categories.

Working Edge Characteristics

This group consists of three attributes: (1) use wear presence or absence, (2) the number of working edges and/or surfaces, and (3) working edge angle. The presence or absence of use wear on grinding tools such as manos and mano/hammerstones was established based on examination with a binocular microscope under 40x magnification. Specimens classified as ground exhibit macro- or microscopic striations; polish; flat, even surfaces; beveled, planoconcave, or ridged transverse cross sections; or evidence of working surface rejuvenation (i.e., pecking). These characteristics were readily observable on quartzite specimens. On sandstone specimens, striations and polish could not be observed at 40x magnification. Rather, specimens with characteristic flat surfaces and either diagnostic cross-sectional configurations or surface rejuvenation were classified as ground stones.

The second attribute counts the number of modified tool edges and/or working surfaces (i.e., ground or pecked surfaces) with or without use wear. The number of modified edges was

recorded on scrapers, choppers, and wedges.

Working edge angles were recorded to gauge potential differences in working edge characteristics between adzes and gouges. The working edge on formal and/or minimally retouched tools is defined as the surface created by the juncture of the ventral face of the specimen and the retouched face that results from the manufacture of the tool and/or rejuvenation of an already worn working edge. The edge angle was recorded with a Ward's contact goniometer. Working edge angle was recorded by averaging two readings taken at different locations along a single working edge. On specimens with multiple working edges, two readings were taken on each edge and averaged.

Base and Stem Treatment

This group consists of two attributes, grinding and beveling, recorded on complete projectile points and proximal fragments. Grinding can be further divided into stem grinding, base grinding, base and stem grinding, and grinding absent. On distal and medial point fragments, grinding was recorded as indeterminate. Stem beveling has the following states: alternate left, alternate right, indeterminate, and absent. In determining which side of the stem was beveled, the projectile point was held tip forward. On proximal fragments with only a small stem segment present, the attribute was recorded as indeterminate.

Blade Treatment

This group also was recorded on projectile points only. It has two attributes, beveling and serration. Beveling has the following states: alternate right, alternate left, and absent. In determining which side of the blade was beveled, the projectile point was held tip forward. On proximal fragments with only a small blade segment present and on stem fragments, the attribute was recorded as indeterminate. Serration was recorded as present only when highly patterned and purposefully executed. Serration that seemed to be the incidental and unpatterned result of blade reworking was not considered as a manifestation of the attribute.

Flake Typology

To reconstruct the types of reduction strategies and reduction sequences represented in the unmodified debitage collections from archeological sites, two general approaches can be employed. In the first, one records a series of potentially diagnostic attributes (e.g., platform faceting, platform grinding, longitudinal flake curvature, flake outline shape, platform shape, number of dorsal flake scars, orientation of dorsal flake scars, presence or absence of dorsal ridges, size, and dorsal cortex percent) on each piece of debitage. Next, these attributes are summarized for each specimen to provide a best estimate of the reduction techniques and/or sequences responsible for its production. In the second method, diagnostic flake types are defined a priori through a list of attributes that are most characteristic of specific reduction techniques and/or sequences. In the subsequent analysis, each flake is assigned to one of the possible reduction strategies and sequences diagnosed from the analysis of the tools and debitage. The advantage of the first approach is that it provides all of the data used to derive the eventual flake typology classifications so that one can directly evaluate their applicability. On the other hand, it requires the analysis and coding of a potentially large number of attributes and a second stage of analysis where the attributes are summed for each flake to derive a particular typological assignment. The second approach results in an immediate identification of flake type, but it does not provide the detailed attributes on which each flake type assignment was based; it involves the recording of only one attribute for each flake. The second approach was employed in this analysis to learn as much as possible from the unmodified debitage without a prohibitively large amount of effort. All of the unmodified debitage from National Register–eligible sites was classified into one of eight flake type categories: (1) biface reduction, (2) biface thinning, (3) biface resharpening, (4) notching, (5) platform/core preparation, (6) uniface manufacture/ resharpening, (7) macroflake blank, and (8) blade blank. The attributes used to identify each flake type are presented below. Complete flakes and flake fragments that possessed ambiguous features or lacked sufficient features to allow their classification into one of these groups were categorized as indeterminate.

BIFACE REDUCTION FLAKES

Biface reduction flakes are primary and

secondary flakes usually removed by a hard hammerstone or large soft billet; they exhibit minimal to considerable longitudinal curvature and moderate to large dorsal flake scar ridges. Dorsal flake scarring is indicative of sequential flake removals and flake removals derived from opposite bifacial edges on large flakes that extend past the middle of the biface. Striking platform faceting ranges from single to multifaceted with one and two facets most common. Unground striking platforms are common, although flakes with ground platforms are also present.

BIFACIAL THINNING FLAKES

Tertiary flakes removed by soft hammerstone or billet that exhibit a moderate to large number of dorsal flake removal scars, shallow flake scar ridges, and moderate to slight longitudinal curvature are classified as bifacial thinning flakes. Thinning flakes removed from moderately convex bifaces will have moderate curvature; flakes removed from bifacial artifacts with lenticular cross sections (i.e., thin bifacial knives) will have only slight longitudinal curvature. Striking platforms are usually multifaceted and ground with some lipping on the ventral edge of the striking platform. Flake shape ranges from relatively broad to narrow with parallel edges to more trapezoidal and/or expanding triangular.

BIFACE RESHARPENING FLAKES

Small flakes (less than 20 mm) characterized by multiple shallow dorsal flake scars, slight to moderate longitudinal curvature reminiscent of the transverse cross section of bifacial knives and dart points, and a very small striking platform with use-related polish and rounding are classified as biface resharpening flakes. Although most biface resharpening flakes are removed by pressure from finished and worn tools, the striking platforms of resharpening flakes may be unifacial because pressure flaking tools require a very small point of contact for fracture initiation (Frison 1968).

NOTCHING FLAKES

Notching flakes are small flakes (5–15 mm) removed by pressure flaking to manufacture notches along the basal and/or lateral margins of a biface in order to create a hafting element. The most distinctive characteristic of the flake is the recessed, U-shaped platform. The dorsal face of the flakes is typified by a deep, semicircular scallop which results from prior sequential notching flake removals (Austin 1986).

PLATFORM AND/OR CORE PREPARATION FLAKES

Flake sizes range from small (less than 10 mm) to large (greater than 40 mm) depending on the stage of reduction when they were removed and/or the size of the parent material (core/artifact) from which they were removed. Shapes range from blade or bladelike to a rounded half-moon shape depending on the type of core. Specimens may range from entirely decorticate to entirely corticate depending on stage of reduction and core type. Core preparation flakes removed during blade core preparation are usually single faceted, while platform preparation flakes removed from bifacially flaked cores range from single to multifaceted.

UNIFACE MANUFACTURE/ RESHARPENING FLAKES

These are small to medium flakes with single facets, often characterized by a slight longitudinal curvature adjacent to the distal end. The dorsal surface has a pronounced ridge that runs perpendicular to the longitudinal axis of the flake and is formed by the intersection of the original dorsal surface of the blade blank with the flake scars created by the removal of flakes from the working edge or lateral edges of the blank during manufacture and/or resharpening. In general, the dorsal face retains a series of parallel flake removal scars and shorter step-fractured removals derived from previous manufacture activity and attempts to resharpen the working edge. Resharpening flakes can be distinguished from manufacture flakes by the presence and nature of use wear on the platform (i.e., ground platforms resulting from manufacture are distinct from rounded, polished, and sometimes striated platform facets derived from use).

Three uniface rejuvenation methods identified by Shafer (1970) each produce distinct and diagnostic flake types. The first rejuvenation method removes a worn or heavily step-fractured and deeply undercut working edge by using a striking platform located on the side of the uniface and removing a long burin-bladelike flake that contains the flat ventral surface on one face and the working edge of the uniface on

the other. These bladelets might be moderately curved or relatively straight depending on the shape of the working edge being removed. The striking platform of this flake will be multifaceted, and the blade will be relatively narrow and retain a strong dorsal ridge formed by the intersection of the original flake's ventral surface and the working face of the tool. The second method of uniface rejuvenation removes bits of the worn working edge by using the ventral surface of the uniface as a platform surface for removing small segments of the worn edge. This is accomplished by striking flakes along the working edge toward the dorsal surface of the tool. Generally, these flakes exhibit the following characteristics: single-faceted striking platforms; a series of step-fractured flake scars on the dorsal face of the flake immediately behind the platform; multiple parallel flake scars on the dorsal face; a longitudinal curvature, particularly immediately adjacent to the distal end; and a dorsal ridge running perpendicular to the long axis of the flake. In other words, these flakes will be identical in morphology to most uniface manufacture flakes. One major diagnostic feature is the presence of use wear on rejuvenation flakes, compared to its absence on manufacture flakes. The third method of uniface rejuvenation involves the removal of the worn edge by using the leading face of the working edge as the striking platform for flakes from the ventral face of the uniface towards the proximal end of the tool. Flakes created in this fashion have multifaceted striking platforms that retain a portion of the working face of the unifacial tool. The dorsal surface of the flake will retain the ventral surface of the uniface. The flake often terminates in a hinge fracture due to the difficulty of removing feathered flakes from surfaces characterized by striking platforms that are at nearly 90° angles to the surface being flaked.

MACROFLAKES

Large (greater than 100 mm), usually hard hammer secondary or tertiary flakes often used as blanks in the manufacture of large bifacial tools are known as macroflakes. Platforms may be single or multifaceted and are massive, as are the bulbs of percussion. Dorsal faces may be entirely decorticate but often retain relatively large dorsal flake scar ridges left from previous flake removals. Macroflakes differ from other flake blanks used in dart point or arrow point manufacture in that they are much larger and are nearly always removed by hard hammerstone percussors. In contrast, smaller flake blanks used in dart point and arrow point manufacture may be the products of billet percussion.

BLADE BLANKS

These flakes are twice as long as they are wide and normally have single or multiple dorsal ridges indicative of previous removals. In general, these flakes have parallel sides and may have a slight to moderate longitudinal curvature which may be an intentional feature useful in the manufacture of some artifacts such as end scrapers. The striking platforms of these blades are usually single faceted and/or corticate, although striking platforms with two or more facets are also encountered.

Weight

Weight was recorded to the nearest tenth of a gram with an Ohause electronic scale. It was measured for complete arrow points, dart points, choppers, wedges, manos, and hammerstones.

Data Manipulation

The analysis of each chipped and ground/battered artifact category was preceded by recording each relevant attribute on coding sheets and then inputting the data into a computerized database. Since each tool was assigned a unique specimen number at the time it was cataloged, any encoding or analysis errors noted in the database (e.g., missing or incorrect attributes) were corrected by pulling the specimen. Because the majority of the unmodified debitage was not cataloged with individual specimen numbers and debitage attributes were entered directly into the database without prior data entry on a coding sheet, it was difficult to physically re-locate individual flakes when key stroke, coding, and/or analysis errors occurred. Following data entry and during database editing, 44 unmodified debitage specimens (0.32 percent of 13,902) contained identifiable inconsistencies (e.g., a chip with platform faceting; a complete flake without platform faceting; an attribute coded outside of possible range). Eleven of these specimens were re-located and corrected because they came from proveniences with only a few flakes. The remaining 33 specimens are

from sites with large debitage samples (24 from 41BL155, n = 6,379; 8 from 41BL827, n = 2,101; and 1 from 41CV944, n = 1,014), which makes the identification of the specific flake nearly impossible. Since the incorrectly coded specimens make up less than 0.5 percent of the respective site samples (0.4, 0.4, and 0.1 percent, respectively), they were simply deleted from consideration during analysis.

Management of the analysis data was accomplished using the Minark Archaeological Database System (Johnson 1988). In addition to database management options, the program also provides crosstabulations and descriptive statistics for basic data analysis.

QUALITY CONTROL PROGRAM

To insure that a high standard of quality was maintained, a Quality Control (QC) program established procedures for conducting periodic independent reviews of the work. The primary objectives of the QC program were (1) to establish a system of communication to ensure that responsibilities and job descriptions of various project personnel were clearly understood and followed; (2) to maintain consistency between individual site investigations conducted under all delivery orders and between different field seasons; (3) to maintain a high quality of work by establishing a process for periodic review of all phases and aspects of field, laboratory, and analysis work by a company employee not directly involved with the project; and (4) to ensure that National Register criteria were being uniformly applied and that site evaluations were conducted in a consistent and replicable manner. The QC program generally followed the program previously established by Mariah for their intensive shovel testing program (Trierweiler, ed. 1994:92–95) but was modified to meet the specific requirements of the testing and evaluation phase.

To meet the first two objectives stated above, PAI prepared two procedures manuals outlining the methods and standards of archeological field and laboratory/analytical work; these were used throughout the project. The *Field Procedures Manual for Archeological Testing and Evaluation at Fort Hood, Texas,* outlines the duties and responsibilities of all of the key project and field personnel, including crew members. It describes the field methods and techniques employed and presents examples of standard data forms used in the field (e.g., excavation record forms, photo logs, and backhoe trench profile forms). In addition, this field manual implemented the following procedures to help maintain high-quality archeological data recovery:

1. Field orientation and methods training for all archeological field personnel.
2. Daily review of all field records by Field Supervisors to ensure completeness and consistency.
3. Standardization of all aspects of archeological investigations (e.g., artifact and feature terminology, artifact typologies, recognition and interpretation of natural and cultural stratigraphy, methods for establishing site chronology, and consistency and comparability of site maps and excavation records).
4. Periodic meetings of all field personnel to ensure standardization of methodology among and/or between crews.
5. Rotation of field crew members as needed to ensure continuity through each field season and maintain an adequate level of experience on all crews.
6. Preparation and review of special field record forms to standardize archeological data recording for the project.

The *Laboratory and Analysis Procedures Manual for Archeological Testing and Evaluation at Fort Hood, Texas,* outlines the duties of all key project and laboratory personnel, including lab assistants. It also describes standard laboratory and data analysis procedures and presents examples of the standard forms used in the lab (e.g., artifact and sample inventory forms).

Each employee involved in field or laboratory/analysis work was given a copy of the appropriate procedures manual prior to beginning work. One or more key project personnel discussed the manual with employees on an indi-

vidual or group basis to insure that the procedures were being effectively communicated.

Safety issues in the field and the lab were also a primary concern. Safety issues are discussed in both the field and laboratory procedures manuals and were stressed by all key project personnel.

To meet the third and fourth objectives mentioned above, a QC Officer was designated to serve as an independent observer, i.e., a PAI employee not directly involved with the Fort Hood archeological project. The QC Officer's primary task was to review the project periodically and determine the following: (1) that the scope of work and contract requirements were being followed; (2) that all field procedures were being followed and were appropriate, and that the data recovered were recorded properly; (3) that the field and laboratory/analysis procedures manuals were being used effectively; and (4) that archeological site investigations, data recording, and National Register evaluations were done in a consistent and appropriate manner.

To ensure that the QC Officer monitored work consistently, a QC Inspection Form, patterned after a form used during previous investigations by Mariah (Trierweiler, ed. 1994:Appendix B), was developed. The QC Inspection Form asks specific questions relating to four different aspects of each delivery order: the Scope of Work and contract requirements, archeological fieldwork, laboratory and analysis work, and NRHP site evaluations. The QC Officer conducted periodic inspections of various aspects of the prehistoric site testing and evaluation project and reported directly to the Principal Investigator. When necessary, recommendations for changes to improve the efficiency of various aspects of the archeological investigation were made. All recommendations and suggestions were given to the Project Manager, Field Supervisors, and Crew Members.

RESULTS OF TESTING— BELL COUNTY SITES

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41BL69

Site Setting

Site 41BL69 is located on an upland peninsula (Manning surface) which overlooks Belton Lake (Figure 6). At the east end of this peninsula, the site extends down to the base of the escarpment at 200 m above mean sea level. The scarp is nearly vertical and rises ca. 20–25 m to the upland surface. The vast majority of the site is located on the upland, which supports a fairly dense oak and juniper forest. Several roads provide breaks through the vegetation on the upland, which has been and continues to be impacted by vehicular traffic, bioturbation, and ubiquitous sheet erosion. Two rockshelters (designated Shelters A and B by previous investigators) are located within the east-facing escarpment.

Previous Work

On 29 July 1949, R. L. Stephenson of the National Park Service River Basin Surveys first recorded the site as a rockshelter. Very few notes were taken and no further work was recommended.

On 2 October 1982, Briuer (Food Hood) formally recorded the site as a burial shelter with cultural materials extending onto its talus. Flakes, scrapers, bifaces, burned rocks, and mussel shells were observed. Human skeletal remains (many badly broken) were collected. Three large potholes, ca. 75 cm deep, were present, and more than 50 percent of the site was thought to be disturbed by vandalism and erosion. However, the deposit was estimated to be up to 1 m thick, and some areas within the shelter and on the talus appeared to be intact.

Meiszner, Turpin, and Ensor (Texas A&M University) rerecorded the site on 10 May 1984. Site boundaries were expanded to encompass an upland lithic scatter, another rockshelter, and a shell midden, in addition to the previously recorded rockshelter. Site dimensions were given as 360x110 m, with a north-south long axis. Bifaces, debitage, burned rocks, one hammerstone, and two dart points were collected on the upland. Shelter A (the shelter recorded by Briuer) was located near the base of the escarpment. Lithics, burned rocks, and mussel shells, in addition to human remains (some collected) were noted in Shelter A. The depth of deposits was estimated to be greater than 1 m, with 70 percent having been impacted by vandalism. Shelter B was located approximately 175 m to the north of Shelter A, just below the edge of the upland. Small numbers of flakes and mussel shells were observed in this shelter. The shell midden was located on the shoreline at the southeast site margin approximately 100 m south of Shelter A. Overall, the site was estimated to be 50 percent disturbed by heavy machinery, bivouac activities, and vandalism.

Kleinbach and Abbott (Mariah) revisited and reevaluated the site on 9 June 1993. The site was divided into Subareas A–C based on differential geomorphic contexts and the potential for intact cultural deposits. Subarea A subsumed a narrow projection of the Manning surface and the rocky lakeshore. Widely scattered debitage was observed across bare bedrock over much of the upland. The shell midden noted by the previous investigators on the shoreline was not re-located and was presumed to have been destroyed by fluctuations in the water levels of the reservoir. Therefore, the site dimensions were

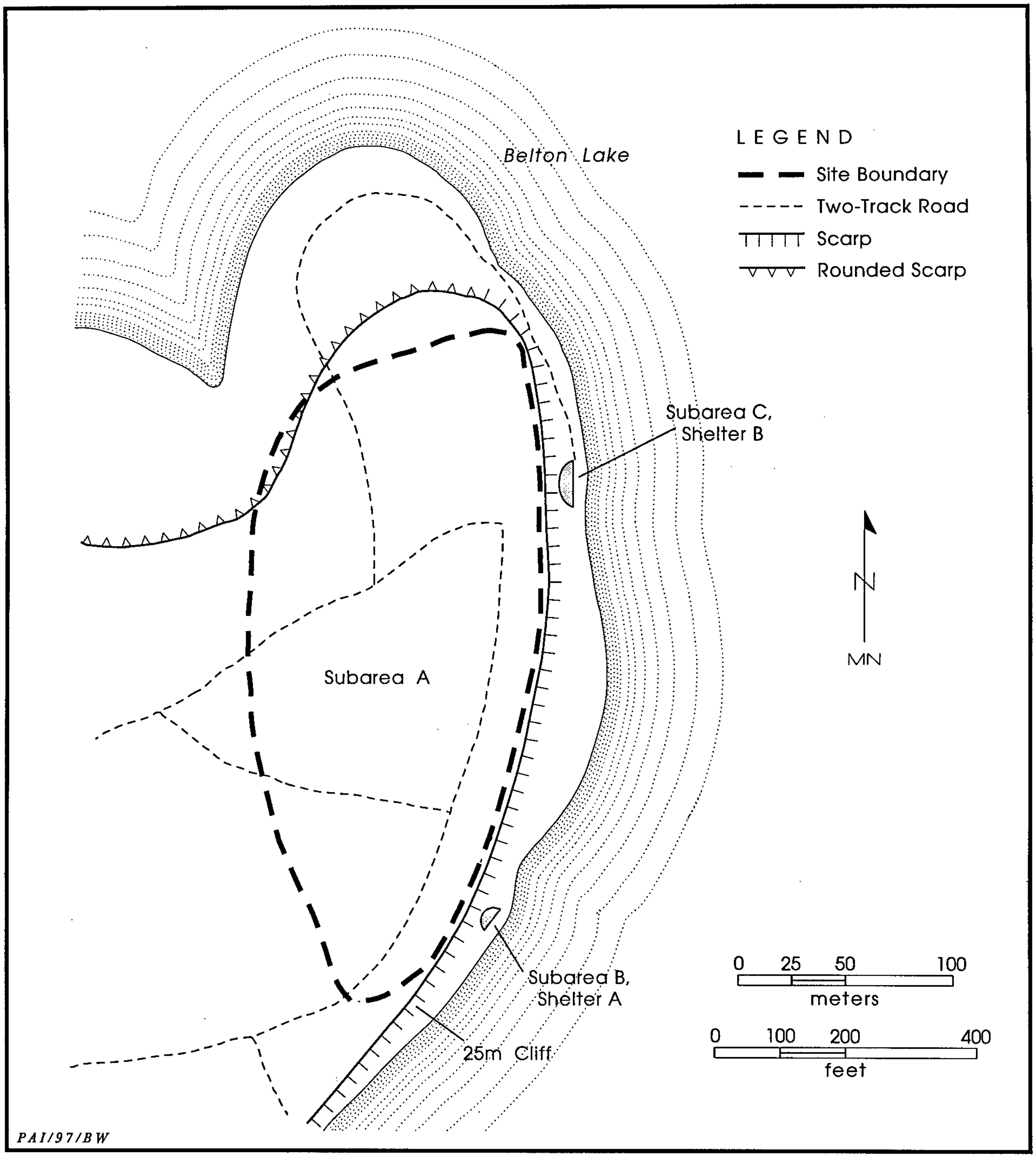

Figure 6. Site map of 41BL69 (modified from Trierweiler, ed. 1994:A9).

reduced to 300x100 m. Since Subarea A was erosional and had no potential for intact cultural deposits, subsurface testing was not warranted.

Subarea B consisted of Shelter A. No cultural materials were observed within the shelter itself, and it was noted to be largely devoid of fine-grained deposits. The talus in front of the shelter had been severely vandalized, exposing human skeletal remains, mussel shells, burned rocks, and debitage. Interestingly, the old potholes in the shelter were no longer visible, and only the front portion of the talus was noted to

be vandalized. The talus was estimated to have 20–30 cm of stony clay loam deposits, much of which appeared to be relatively intact. No subsurface testing was conducted at this time due to the presence of human remains.

Subarea C consisted of Shelter B. Approximately one-half of the shelter's mouth was blocked by a fresh limestone spoil pile. The shelter appeared to contain strongly churned deposits; however, at least some intact deposits appeared to remain. A few flakes and mussel shell fragments on the spoil pile were the only cultural materials observed. At the northwest portion of the shelter, one 50x50-cm test quad and a small shovel test were excavated to bedrock at 10 and 25 cm, respectively. One flake and a few mussel shells were found in the test quad, and a few flakes and mussel shells were found in the shovel test.

The cultural materials within Subarea A (upland) were judged to lack contextual integrity. No further management was recommended for this subarea. Subareas B and C (Shelters A and B, respectively) both had the potential for intact cultural deposits of unknown significance. A minimum testing effort of 2 m^2 of manually excavated test pits within each shelter was recommended to assess National Register eligibility (Trierweiler, ed. 1994:A8–A12).

Work Performed

Formal testing of Subareas B (Shelter A) and C (Shelter B) was completed on 14 September 1995. The test excavations included three 1x1-m test units (Test Units 1, 2, and 4) in Shelter A and one 1x1-m test unit (Test Unit 3) in Shelter B. A total of 3.7 m^3 was manually excavated.

Test Unit 1 was placed at the southern end of the Shelter A talus deposits above a large pothole in the talus, oriented parallel to the shelter's back wall at 358°, and excavated to bedrock at 80 cm. Test Unit 2 was placed at the center of the talus, oriented to 15°, and excavated into a dense zone of spalls at 150 cm. This part of the talus was relatively level and appeared to be undisturbed. Test Unit 4 was placed in the northern half of the talus adjacent to a pothole, oriented to 20° magnetic north, and excavated to bedrock at 100 cm. Stratigraphic descriptions of the sediments in Shelter A were recorded for Test Units 2 and 4.

Test Unit 3 was placed just inside the dripline at the south end of Shelter B, oriented to 42°, and excavated to 32 cm. Excavations ended at this depth because an intact human burial (Feature 1) was identified. Upon discovery of this feature, all recovered cultural materials were returned into the test unit and the unit was backfilled.

Shelter A

Extent and Depth

Shelter A is located at the base of the cliff face and measures approximately 17x3.5x1.7 m (Figure 7). The deposits within this shelter and those composing the talus have been extremely disturbed by vandalism and bioturbation caused by fluctuations in the water level of Belton Lake. There is no vegetation within the shelter itself, but its talus has a moderate overstory of hardwoods. The sediments in Shelter A are shallowest at the back wall and increase in thickness to the front of the talus. Cultural materials were found to a depth of 90 cm below the surface in the rockshelter and to 150 cm in the talus.

Sediments and Stratigraphy

In Shelter A, the fill within each of the test units is indicative of sediment Type 1 described by Abbott (1994b; 1995b). The following description is of the west wall of Test Unit 2 (see Appendix B) as shown in Figure 8. Four general zones, each dipping eastward, were delineated; therefore, depths below surface vary across each zone. The uppermost level, Zone 1, is a 39-cm-thick, grayish brown sandy clay loam with many granule- to pebble-sized spalls. Zone 2 is a gray sandy clay loam that is 57–65 cm thick and contains many granule- to pebble-sized spalls. Zone 3 is a 20- to 28-cm-thick zone of densely packed, cobble- to boulder-sized angular spalls. The spalls are so densely packed that there are few interstitial pockets and little fine-grained sediment within these pockets. Underlying the zone of densely packed spalls is a 26-cm-thick very pale brown sandy clay with many granule-sized spalls, Zone 4. The presence of recent debris and the jumbled nature of Zones 1 and 2 suggest that they are not intact and that they most likely were disturbed by looting activities. Zone 3 may also be disturbed; it appears to be a recent deposit due to the lack of fine-grained sediment

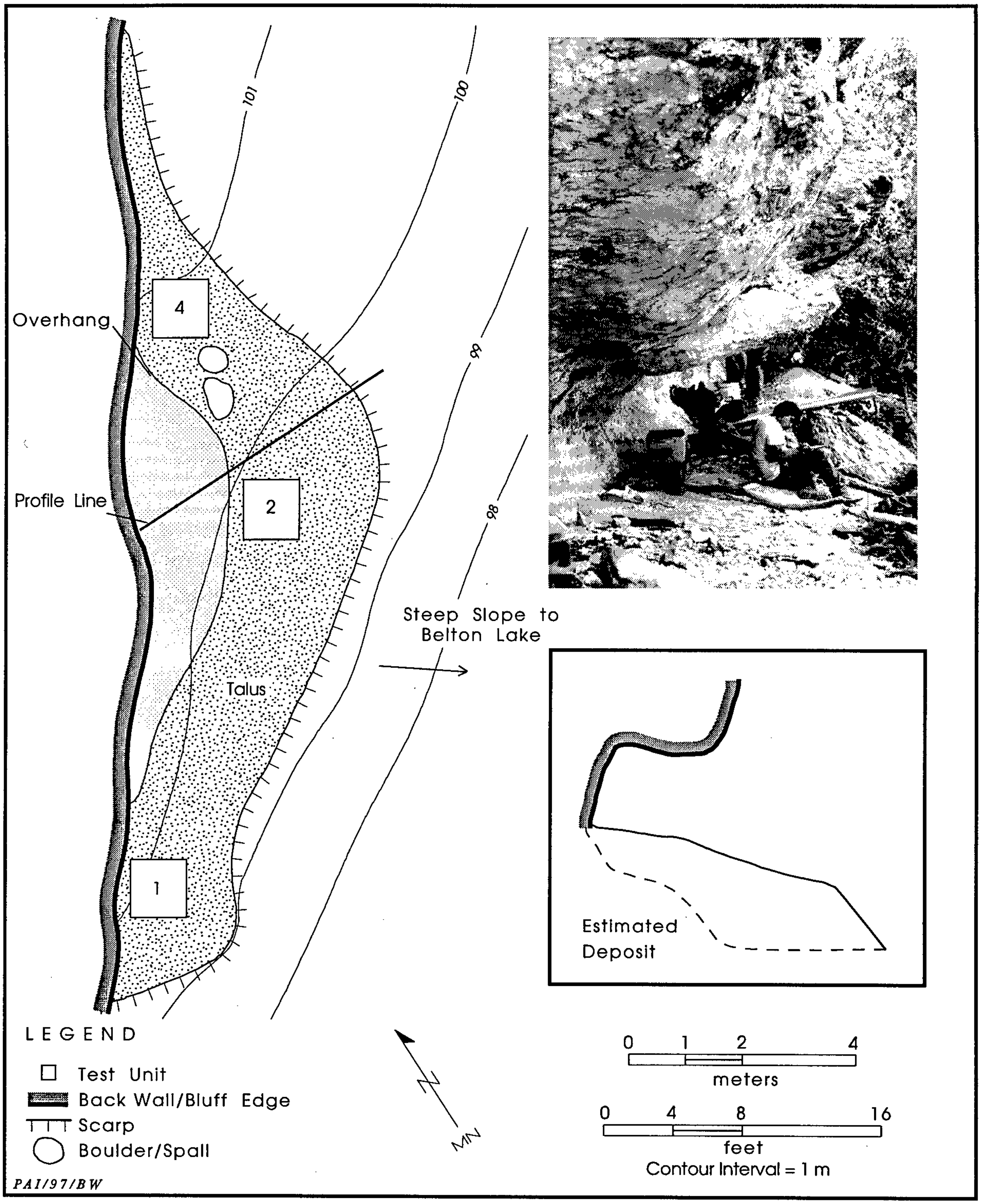

Figure 7. Photograph, plan, and profile views of Shelter A, 41BL69. Photograph view is northeast.

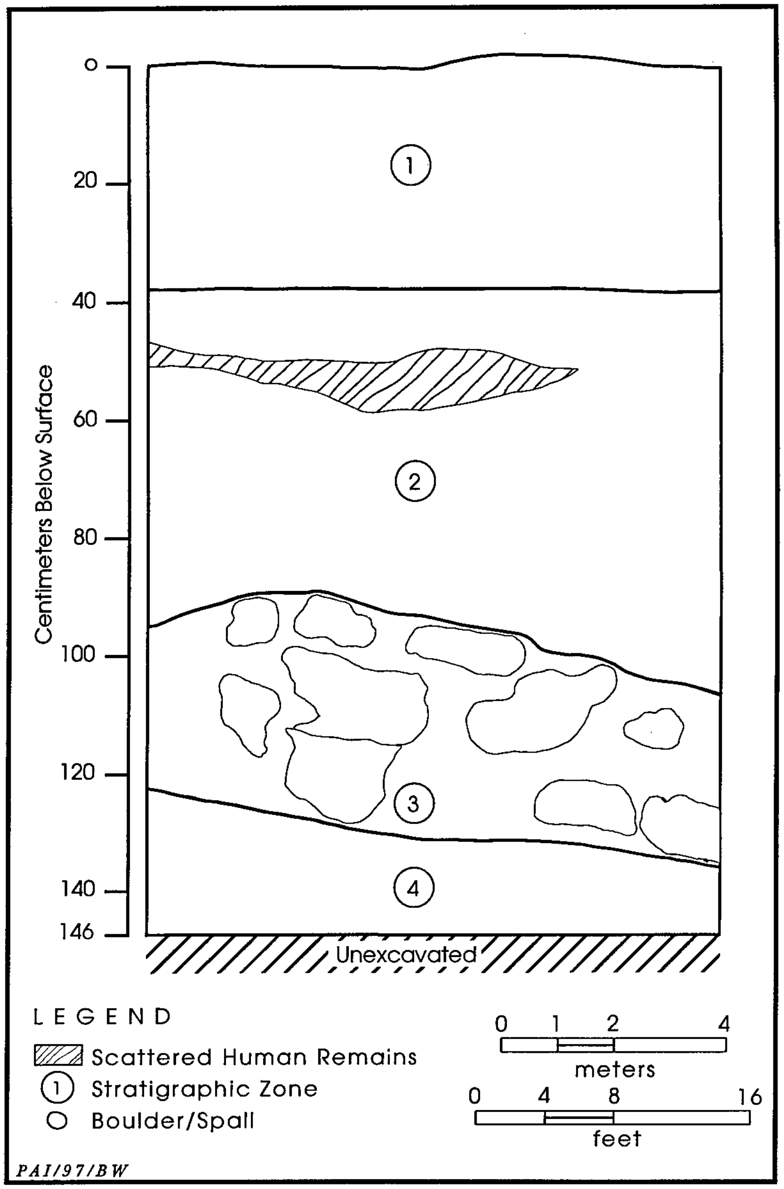

Figure 8. Profile of west wall of Test Unit 2 in Shelter A, 41BL69.

and voids between spalls. The basal zone (124–150+ cm) is considered to be intact and can be traced upslope to Test Unit 4, where it narrows to approximately 11 cm in thickness and rests on bedrock.

Cultural Materials

Cultural materials were found throughout the deposits associated with Shelter A; however, the majority were recovered from the talus deposits. Artifacts recovered include 1 untypeable arrow point, 14 chipped stone tools, 679 pieces of unmodified debitage, 3 pieces of ground stone, and 3 modified mussel shells (Table 6). Other materials found include 631 unmodified mussel shells, approximately 6 kg of burned rocks, and many bones. Because the overwhelming majority of the bones were human remains found in disturbed context, all bones were returned to the excavation units prior to backfilling.

Discussion

The untypeable arrow point is the only diagnostic artifact recovered from Shelter A. This arrow point indicates that the shelter was occupied during the Late Prehistoric period. The rather thick deposit, which contains a relatively large amount of lithic and faunal cultural materials, indicates that the occupation was lengthy. Numerous fractured human skeletal remains were found within the vandalized talus, indicating that the shelter was used in conjunction with mortuary practices. Although many (n = 57) of the unmodified mussel shells exhibit burning and a small amount of burned rocks was observed, no cultural features were identified due to the severity of disturbance.

Shelter A was estimated to be 50 percent vandalized in 1982 and 70 percent disturbed in 1984, with each of the investigators noting numerous, deep potholes. In 1993, the investigators noted little vertical exposure in the vandalized areas and suggested that a large portion of the talus appeared to be undisturbed. Several large pieces of driftwood were present on the talus and within the shelter itself, and erosional scars were visible across the entire length of the talus. This evidence supports the notion that fluctuations in the water level of

Table 6. Artifacts recovered from Shelter A, 41BL69

Arfifacts	Test Unit 1	Test Unit 2	Test Unit 4	Totals
Arrow point	0	1	0	1
Perforators	0	1	1	2
Adzes	0	2	0	2
Scrapers	0	4	0	4
Miscellaneous bifaces	0	3	3	6
Unmodified debitage	9	312	358	679
Ground stones	0	3	0	3
Modified shells	0	3	0	3
Totals	9	329	362	700

Belton Lake from 1984 to 1993 erased all surface evidence of vandalism (i.e., the potholes). Intact deposits were observed only in two areas. These were the basal units (Zone 4) in Test Units 2 and 4. No cultural evidence was identified in these basal deposits, which are buried under a thick wedge of recently reworked colluvium that has been disturbed through looting and lake level fluctuations. Based on the previous documentation of the extent of vandalism to the shelter's deposits, the assumption that the deposits have been further disturbed by water level fluctuations, and the results of the test excavations, it appears that the cultural deposits associated with Shelter A have been virtually destroyed.

Shelter B

Extent and Depth

Shelter B is located high on the escarpment face and has maximum dimensions of 20.4x5x3.9 m (Figure 9). The deposits within this shelter are derived from the disintegration of the limestone walls and ceiling and have been minimally disturbed by bioturbation. In contrast to Shelter A, Shelter B does not have a developed talus. Instead, a limestone shelf is exposed just beyond the dripline of this shelter. A few roots from several juniper trees and a cedar elm situated near the shelter's mouth have encroached into the deposits within the shelter. The depth of deposits in Shelter B was not fully investigated due to the termination of excavation upon discovery of the intact burial (Feature 1) at 32 cm. However, based on the position of the exposed limestone shelf and the potential bedrock encountered at the west edge of Test Unit 3, the deposits are thought to be no more than 45–50 cm thick (although they could be deeper in other parts of the shelter).

Sediments and Stratigraphy

The fill in Shelter B is indicative of sediment Type 1 described by Abbott (1994b: 343). The north wall profile of Test Unit 3 is divided into two zones. Zone 1 is a 5- to 10-cm-thick pale brown unconsolidated silt, and Zone 2 is a light brown silt that extends to the base of the excavation. The division of zones could not be distinguished directly above Feature 1 (Figure 10), most likely because the sediments were manipulated during the interment or during subsequent occupation.

Cultural Materials

Sparse cultural materials were observed in the excavation of Test Unit 3. With the exception of the five burned rocks found immediately above the burial, one burned rock, three flakes, and five unmodified mussel shells were found in the sediments above the burial. No collections were made; all materials were returned to the unit prior to backfilling.

Cultural Features

The exposed portion of the burial (Feature 1) measured 61 cm northwest-southeast and 28 cm northeast-southwest (see Figure 10). The burial was oriented north-south, with the head facing west toward the back wall of the shelter. The burial was exposed between 32 cm (the highest elevation point on the skull) and 44 cm (the deepest point of excavation) as measured from the southeast corner of the unit. The exposed remains consisted of the cranium with its articulated mandible, four vertebrae, the left scapula with the articulated humerus, the left radius and ulna, two metacarpals and one phalange located above the radius and ulna, the articulated ball and socket of two unidentified long bones, one fibula, and three unidentified

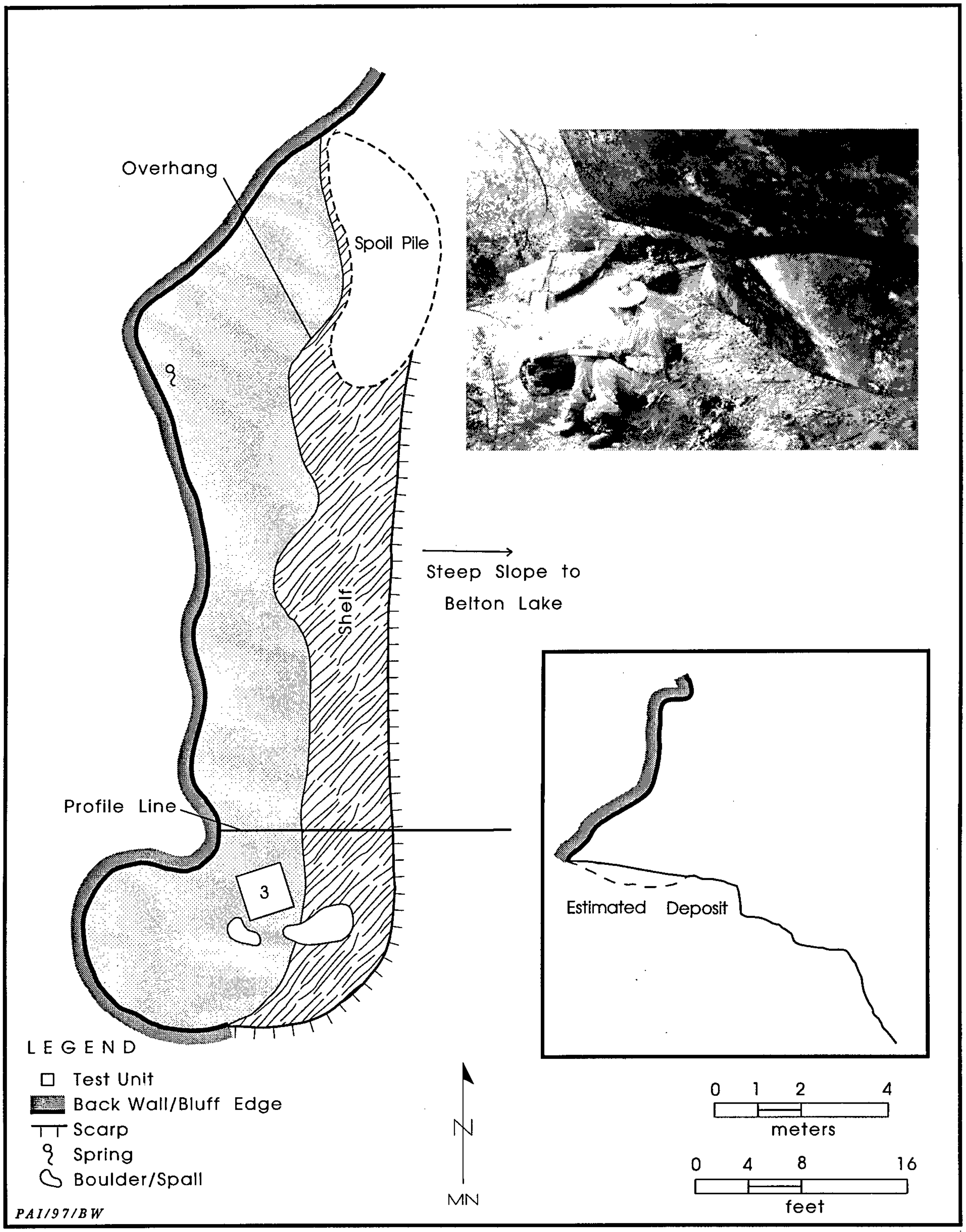

Figure 9. Photograph, plan, and profile views of Shelter B, 41BL69. Photograph view is south.

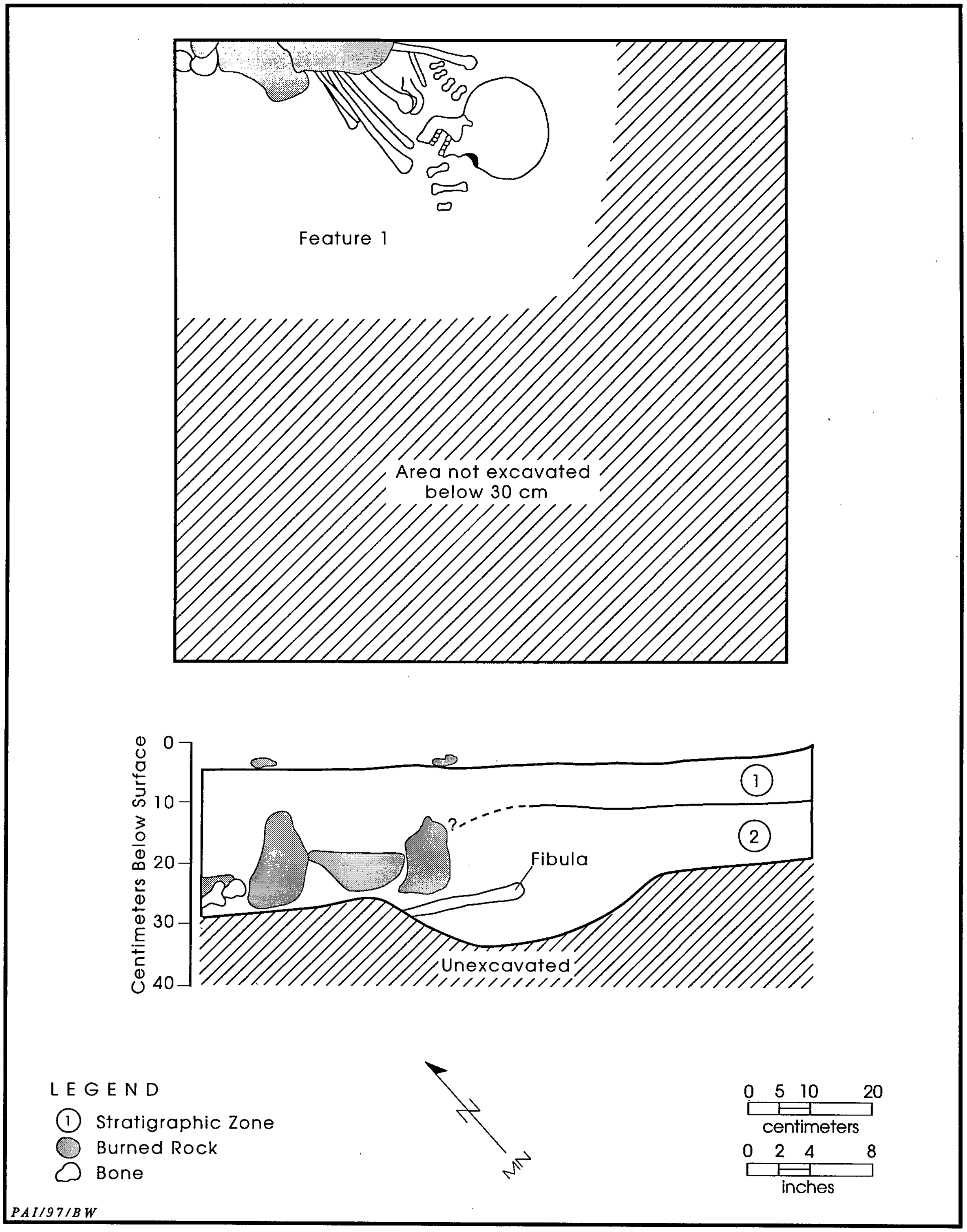

Figure 10. Plan and profile (north wall) views of Test Unit 3 and Feature 1 in Shelter B, 41BL69.

bones. The skull was located in the north-central portion of Test Unit 3, with the remains extending to the northwest corner and north beyond the unit's boundary.

Although articulated remains were encountered, the exposure was limited and only a few general observations can be made. The burial is semiflexed, with the individual interred on the left side facing west. The sizes of the bones suggest that the individual was an adult, but sex could not be determined. No evidence of an excavated burial pit was identified, and no artifacts were found in direct association. The relationship between the five burned rocks (with a few possibly associated chunks of charcoal) and the burial is unclear. These angular burned rocks, visible in the north wall profile (see Figure 10), were exposed at the northwest corner of the unit and extended 40 cm to the east. Four of the five rocks bottomed out at 40 cm and rested directly on top of the human remains. The burned rock in the northwest corner was horizontally laid, the adjacent rock was vertical, and the third and fourth rocks in the series were horizontal and vertical, respectively. The juxtaposition of the fibula directly beneath the easternmost rock in the north wall profile suggests that the fibula may be out of context relative to the rest of the burial. This suggests that the burned rocks represent a separate feature (possibly a hearth?) that postdates and perhaps disturbed the interment. Alternatively, it is possible that the burned rocks were removed from a hearth in the shelter and intentionally laid over the interment as a burial cairn.

Discussion

The small artifact assemblage observed in Test Unit 3 and on the surface of the internal sediments indicates that occupation of Shelter B was brief. In 1993, the investigators noted that Shelter B had been highly disturbed by bioturbation and a large spoil pile. During formal testing in 1995, however, the majority of the deposits within the shelter appeared to be intact. It is not possible for Belton Lake to rise up to the elevation of Shelter B, and thus the deposits have not been disturbed by fluctuations in the lake level. The discovery of an articulated primary human burial confirms that significant intact deposits are present within Shelter B.

41BL155

Site Setting

Site 41BL155 is located on both sides of an unnamed, spring-fed, low-order tributary of North Nolan Creek (Figure 11). The site extends away from the drainage to the east, west, and north onto an expanse of gently sloping upland from 250 to 260 m above mean sea level. The upland east of the tributary supports patches of junipers and oaks, while the west side contains a fairly dense juniper and oak forest. Trees have been cleared from an open grass field at the northern margin of the site. At the northwest corner of the site, a narrow segment of alluvial terrace contains the only substantial deposits on the site. Vegetation on the alluvial terrace consists of a few scattered pecan and large oak trees among open expanses of grasses. The upland areas of the site are highly disturbed by vegetation clearing, vehicular traffic, and sheet erosion. The alluvial terrace is the least affected area of the site, although it, along with the uplands, is frequently traveled by military vehicles.

Previous Work

Rodgers (Fort Hood Archeological Society) first described this site on 9 June 1973 as a campsite located on the north side of a tributary of North Nolan Creek. The site was defined as measuring 30 m in diameter, and cultural materials observed included debitage, bones, burned rocks, scrapers, fossil oysters, and snail shells. The site was noted as being slightly "potted," and the deposits were estimated to be about 45 cm thick.

Davis and Dureka (Texas A&M University) rerecorded 41BL155 on 11 March 1986 as an occupation site. The size of the site was expanded to 800 m east-west by 720 m north-south. In addition to two burned rock middens and two burned rock scatters, a moderate density of cultural materials including debitage, scrapers, bifaces, burned bones, a hammerstone, and large amounts of burned rocks were observed. Two untyped dart points and a keeled end scraper were collected. The alluvial deposits were noted to be less than 1 m thick. An estimated 80 percent of the site had been disturbed by vehicular traffic, cattle, and military activities. Based on

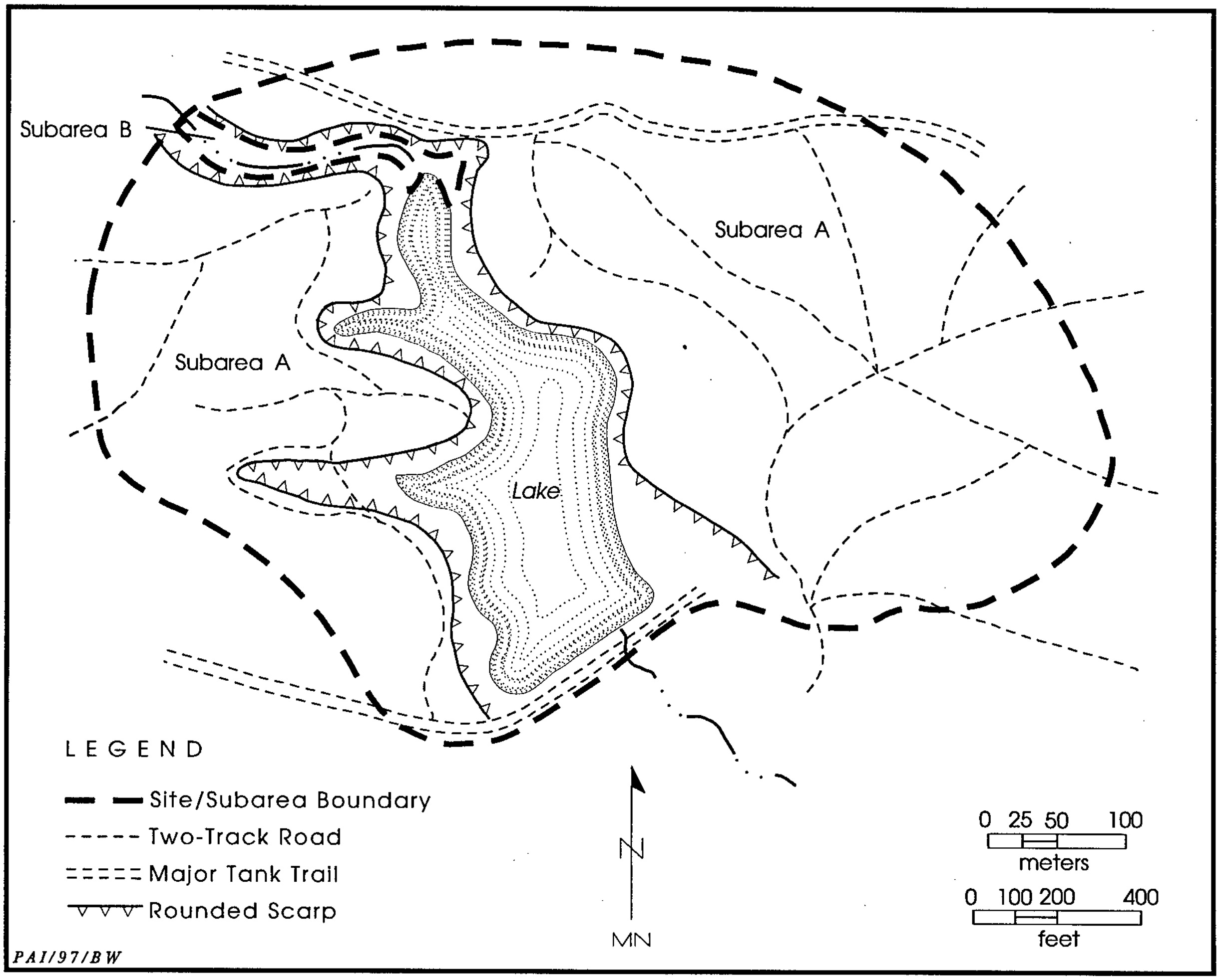

Figure 11. Site map of 41BL155 (modified from Trierweiler, ed. 1994:A56).

its large size (more than 75,000 m^2), the site was subsequently classified as a lithic resource procurement (LRP) site for management purposes.

On 28 December 1992, Abbott and Turpin (Mariah) revisited and reevaluated the site. The site's size was reduced to an area measuring ca. 700 m in diameter. At this time, the site was divided into Subareas A and B based on geomorphic observations and the potential for intact cultural deposits.

Subarea A contained the denuded upland surface and adjacent slopes. A chert resource was observed across the upland surface (lithic material samples were collected), and a small sinkhole was present near the eastern margin. Since Subarea A had been a stable surface throughout the Holocene, its potential for buried cultural deposits was judged to be negligible. However, due to the site's size and the presence of a chert resource, Subarea A was further divided into several impact zones (some were resurveyed) and ultimately into several management units. Results of resurveying led the investigators to conclude that the cultural materials observed within some portions of the denuded upland surface were potentially eligible for listing in the NRHP (Trierweiler, ed. 1994:A55–A63).

Subarea B was noted as encompassing a small section of alluvial terrace (T_1). The terrace deposits were estimated to be less than 75 cm thick, and although the age of the sediments was unknown, the presence of pedogenic carbonate development suggested to Abbott that the deposition occurred no earlier than the middle Holocene. The features observed by previous investigators were not re-located, but a burned

rock midden (Feature 1) was observed in an eroded trail that crossed the terrace. Due to the potential for intact, buried archeological components, shovel testing was recommended for Subarea B.

On 29 December 1992, a crew excavated four shovel tests across the terrace (Subarea B). All of the tests, excavated to 40 cm, were positive. Several flakes, burned rocks, and tools were found in the first three shovel tests, and several flakes and a few tools were recovered from the fourth test. Based on these results, the investigators concluded that Subarea B contained an extensive buried burned rock midden that had considerable potential for containing intact cultural materials of unknown significance. A minimum testing effort of 3 to 4 m^2 of manually excavated test pits was recommended to assess the National Register eligibility of Subarea B (Trierweiler, ed. 1994:A55–A63).

Work Performed

Formal testing of 41BL155, Subarea B was completed on 17 August 1995. Three backhoe trenches and five 1x1-m test units were excavated (Figure 12). A total of 3.4 m^3 was manually dug.

Each of the backhoe trenches was excavated at the midportion of the terrace north of and perpendicular to the unnamed tributary of North Nolan Creek. Backhoe Trench 1 (12x0.8x1.3 m) was placed at the east edge of the terrace and oriented to 341°. Backhoe Trench 2 (11x0.8x1.4 m) was placed at the center of the terrace and oriented to 328°. Backhoe Trench 3 (16x0.8x1.1 m) was placed at the western margin of the terrace and oriented to 213°. Feature 1, the previously recorded burned rock midden, was exposed in the upper portion of each trench profile.

Test Unit 1, oriented to magnetic north and excavated to 80 cm, was placed between Backhoe Trenches 2 and 3. Test Unit 2, excavated to 70 cm, was placed along the west wall of Backhoe Trench 3, where a metate was exposed at 20 cm. Test Unit 5, excavated to 50 cm, was placed as a contiguous unit north of Test Unit 2 to further investigate a large slab-lined hearth (Feature 2). Test Unit 3 was placed along the east wall of Backhoe Trench 1 and excavated to bedrock at 80 cm. Test Unit 4 was placed on the terrace south of the tributary and excavated to dense gravels at 60 cm.

Subarea B of 41BL155 encompasses the thin alluvial terraces on both sides of the Nolan Creek tributary. The subarea is irregular in shape but is wholly contained within an area of approximately 300x500 m. Archeological testing of both the northern and southern terraces was done, but most of the testing concentrated on the northern terrace. Because the northern and southern areas have slightly different depositional contexts and contain very different types of cultural deposits, they are discussed separately.

Terrace North of the Tributary (Analysis Unit 1)

Extent and Depth

The extent of the terrace north of the tributary is approximately 120 m east-west by 40 m north-south. This terrace is level and rises 1–2 m above the modern drainage. The north edge of the terrace abuts the denuded toeslope of the upland surface of Subarea A. The east and west ends of the terrace pinch out where the tributary channel encroaches onto the upland. A burned rock midden (Feature 1) was first observed in a road that transects the east margin of the terrace. This feature extends across the majority of the terrace but was not observed within a road that transects the western edge of the terrace. Cultural materials were observed throughout the profiles of each excavated backhoe trench, although the greatest frequencies of artifacts were within the midden that extends from the surface to 50 cm.

Sediments and Stratigraphy

The profiles of the three backhoe trenches reveal a laterally consistent soil profile (A-Bw-C-Cr profile) across the middle portion of the terrace (see Appendix B). The sediments most likely represent a single alluvial unit with one soil imprint (A-Bw). Correlating this alluvial unit to those defined by Nordt (1992) for the larger stream valleys of Fort Hood is not prudent, however, until further geomorphological investigations can be conducted at this locality and other low-order tributaries at Fort Hood. In the 1992 geomorphic assessment, Abbott postulated that the alluvial deposits at 41BL155 are no older than middle Holocene based on the pedogenic

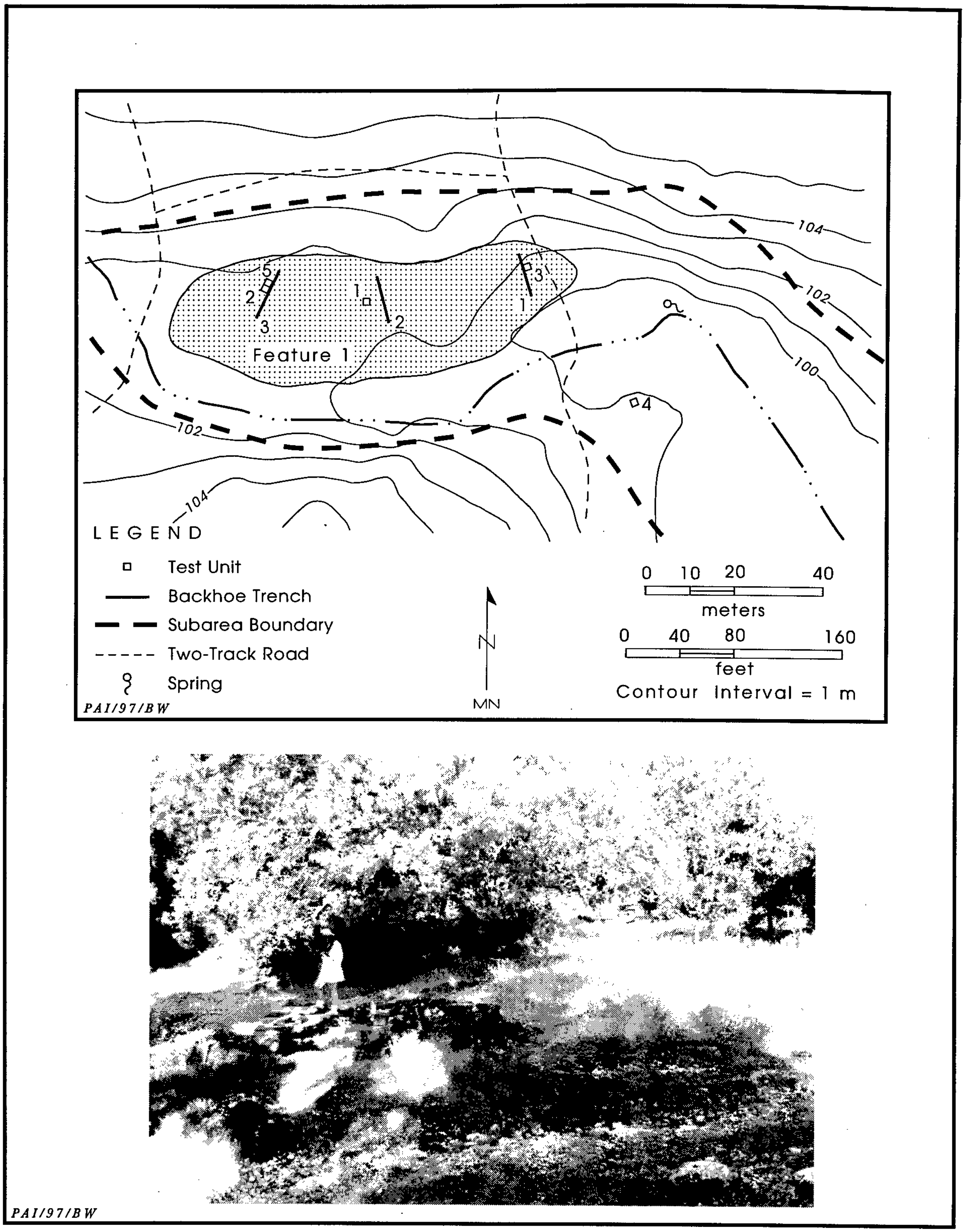

Figure 12. Map of Subarea B and photograph of terace north of tributary, 41BL155.

carbonate morphology. The recovery of only Late Archaic dart points, along with a single charcoal radiocarbon date from the cultural deposits during the current testing program, supports this conclusion (see below). Feature 1 and the vast majority of the cultural materials encountered during testing are encapsulated in a very dark grayish brown to very dark gray clay loam A horizon 34–46 cm thick. The apparent temporal variability of the projectile points recovered from the A horizon suggests that a series of occupations took place at 41BL155 over a long period of time and that these occupations were coeval with a period of slow or episodic sedimentation and pedogenesis. The underlying Bw horizon is a brown to dark brown silty clay to silty clay loam 28–44 cm thick. The recovery of cultural materials dramatically decreased in the Bw horizon. The unweathered portion of the profile (C horizon) is a brown to grayish brown silty clay to clay that is 35–36 cm thick. The slightly oxidized and gleyed nature of the sediments suggests contact with a fluctuating water table. Few artifacts were observed in the C horizon. The entire alluvial unit (A-Bw-C soil) overlies a weathered limestone bedrock (Cr or R horizon).

Cultural Materials

A large and varied artifact assemblage was recovered from the test units in the northern terrace, including 23 dart points, 269 other chipped stone tools, 8 cores, 6,362 pieces of unmodified debitage, 2 metates, and 1 mano (Table 7). The dart points were classified as follows: 4 Darl, 1 Zephyr, 1 Frio, 3 Ensor, 1 Montell, 3 Castroville, 1 Marshall, 4 Pedernales, and 5 untypeable. In addition to these, 1 Ensor was collected from the backdirt excavated from Backhoe Trench 1, and 1 Montell, 1 Marshall, and 2 Pedernales were collected from the backdirt from Backhoe Trench 3. Other cultural materials recovered include a total of approximately 426 kg of burned rocks and 156 bones (see Appendix C). The vast majority of the cultural materials were recovered from the burned rock midden.

Cultural Features

Two burned rock features were investigated; Feature 1 is interpreted as an extensive burned rock midden and Feature 2 is a large intact hearth within Feature 1. The estimated horizontal extent of Feature 1 is based on testing results and surface exposures relative to the restricted nature of the terrace. The feature has maximum dimensions of 90 m east-west by 30 m north-south and encompasses most of the terrace. The midden extended from (or near) the surface to 50 cm in each of the excavation units. When considering Feature 2 is part of Feature 1, a total of approximately 2,195 burned rocks (421 kg), most of the 156 bones, and the overwhelming majority of the 6,665 stone artifacts listed in Table 7

Table 7. Artifacts recovered from the northern terrace, 41BL155

Artifacts	Test Unit 1	Test Unit 2	Test Unit 3	Test Unit 5	Totals
Dart points	6	3	8	6	23*
Perforators	3	1	0	0	4
Adzes	4	2	6	1	13
Knives	18	4	11	1	34
Scrapers	46	19	20	4	89
Choppers	3	0	1	2	6
Gravers	1	2	1	1	5
Multifunctional tools	2	0	1	0	3
Miscellaneous bifaces	16	8	10	4	38
Miscellaneous unifaces	29	21	18	9	77
Cores	2	2	3	1	8
Unmodified debitage	3,087	1,056	1,695	524	6,362
Ground stones	1	2	0	0	3
Totals	3,218	1,120	1,774	553	6,665

*Five additional dart points were collected from backdirt from Backhoe Trenches 1 and 3.

were recovered from the midden. All of the burned rocks are limestone clasts ranging from fractured fist-sized pieces to small fragments. With the exception of Feature 2, no internal patterning was recognized in this jumbled mass of homogeneous burned rock fragments within a very dark gray clay loam. Numerous flotation samples (n = 11) of the dark midden sediments were collected from various locations within the feature; no sizable pieces of charcoal were found, but two small nutshell fragments were observed within these samples. The only evidence of subsurface disturbance consisted of a few recent military items found in the upper 10 cm of the deposits.

Once fully exposed at 16–50 cm in Test Units 2 and 5, Feature 2 consisted of a single basal layer of 36 pieces (76 kg) of thermally fractured tabular limestone, neatly arranged as a large (ca. 150 cm diameter) circular basin (Figure 13). Feature 2 is interpreted as a hearth or bottom lining of a baking pit. Approximately one-third of the feature remains unexcavated west of the test units. The base of the feature rested on the contact of the A and Bw soil horizons. The feature was remarkably intact, with thermal fracturing of several slabs having obviously occurred in situ. One slab that exhibited grinding had been fractured into three pieces. A few large tabular burned rocks and the unburned metate located in the profile of Backhoe Trench 3 were exposed at 20–40 cm in Test Unit 2 and were removed prior to the recognition of the formal arrangement of the other large hearthstones. These rocks were most likely associated with, if not part of, Feature 2. The metate was formed on a tabular piece of oölitic lime-grainstone or lime wackestone, which is similar to the lithology of the Whitestone and Bull Creek Members, respectively, of the Walnut Clay Formation (see Moore and Martin 1966). The Walnut Clay (Killeen surface) crops out nearby, but it is not known whether the Whitestone or Bull Creek Members are present, this sandstonelike material has not been observed on Fort Hood.

Although a limited area was investigated, the presence of ground stones, the virtual absence of faunal remains, and the large size of Feature 2 suggest that large amounts of gathered vegetal foodstuffs were heated (i.e., baked) inside the slab-lined basin. Furthermore, the southern edge of the feature could not be identified in the west wall profile of Test Unit 2 (see Figure 13), which suggests that this edge of the feature could have been destroyed in the process of retrieving the cooked materials. No macrobotanical remains were observed within four flotation samples from inside the basin. Because of its position within the midden, it is impossible to ascertain what cultural materials, with the exception of the burned rocks, were directly associated with Feature 2. Very little charcoal was found, but a small chunk collected from the central portion of the feature adjacent to the lowermost slab at 40–50 cm yielded a conventional radiocarbon age of 2,400 ± 60 B.P. (see Appendix A).

Discussion

The single radiocarbon assay obtained on charcoal collected from the base of Feature 2 provides a calibrated date range of 751–395 B.C. (see Appendix A). This indicates that the site was occupied and the midden was accumulating during the Late Archaic period. However, this date represents a single event (i.e., a probable baking episode) within the midden and thus does not provide an adequate estimate of the duration of occupations or when the burned rock midden started or stopped accumulating. Cultural materials give a better (albeit gross) estimate of the total duration of site occupations. All diagnostic projectile points recovered from the midden are of Late Archaic age and date from approximately 1000 B.C. (Pedernales) to nearly A.D. 1000 (Darl/Zephyr). Although the point styles occur in more or less proper stratigraphic order in Test Unit 1, the point sequence is jumbled within Test Units 3 and 5. Assuming that these point styles were manufactured and used by the site's inhabitants (as opposed to earlier points that were recycled), the artifactual evidence suggests that the midden may have accumulated throughout the latter two-thirds of the Late Archaic period.

Testing results indicate that only the upper 10 cm of the midden has been disturbed; the lower deposits are intact and have a high potential for containing evidence of discrete and definable cultural events in the form of preserved features (e.g., Feature 2). Such features may provide substantial data on burned rock midden formation and function. The midden also contains high densities of lithic artifacts, which

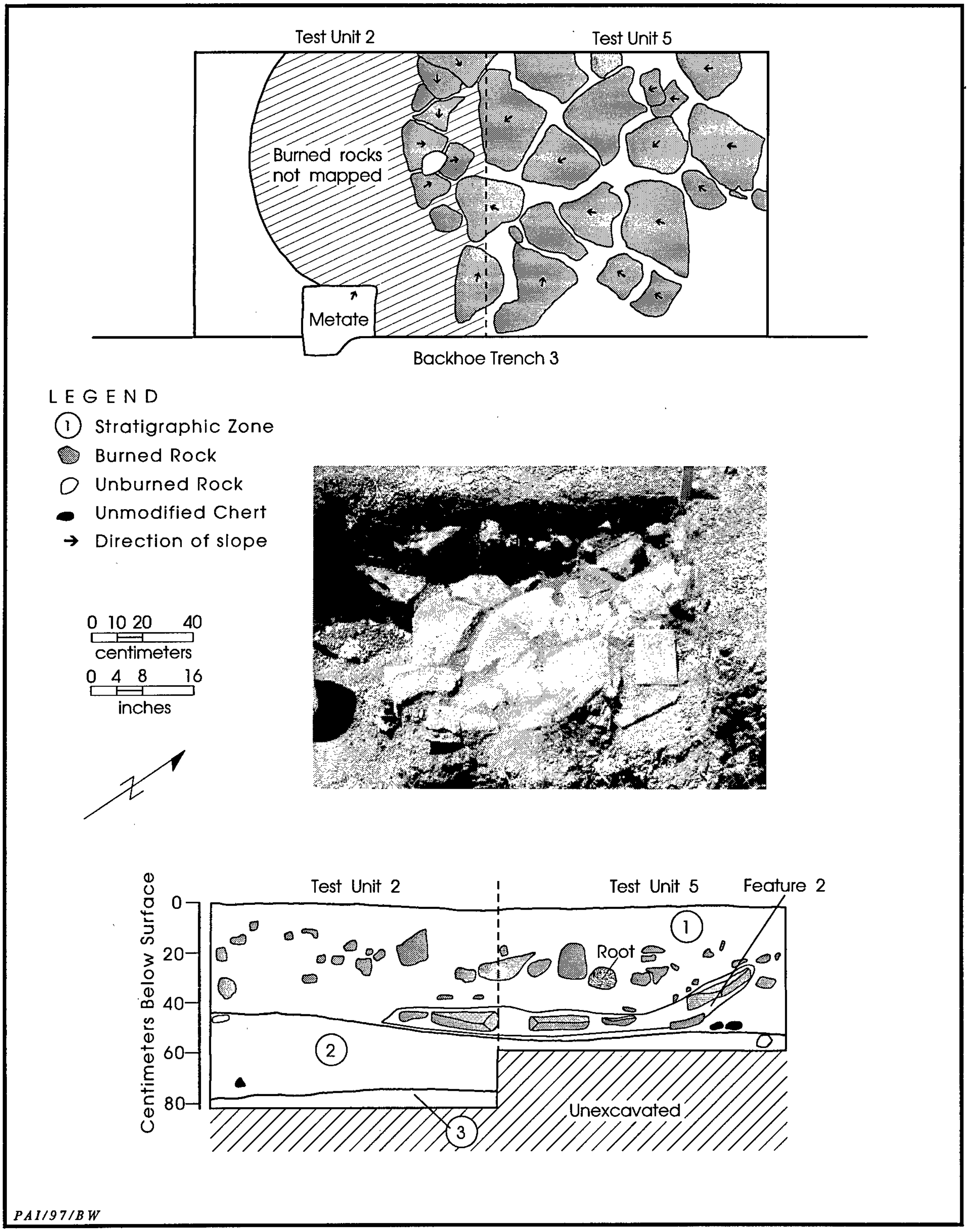

Figure 13. Photograph, plan, and profile views of Feature 2, 41BL155. Not all of the rocks shown in the plan view are present in the photo.

is not surprising since Heiner Lake cherts outcrop across the upland surface adjacent to the terrace. These materials can yield substantial information on lithic procurement/reduction strategies. Faunal remains, including deer, are well preserved. Unfortunately, only a very small amount of macrobotanical remains (i.e., nutshell fragments and tiny pieces of charcoal) were recovered from the flotation samples collected from the midden, and none were found in the samples collected from Feature 2. The cultural deposits are shallow (less than 50 cm) and could be easily disturbed; in fact, this may be the only relatively extensive midden deposit on the Fort Hood military reservation that has not been severely impacted, particularly by vandalism.

Terrace South of the Tributary (Analysis Unit 2)

Extent and Depth

The terrace south of the tributary measures approximately 60 m east-west by 50 m north-south (see Figure 12). The undulating surface of this terrace rises only 50–100 cm above the modern drainage. The southwestern one-third of the terrace has been highly impacted by machinery where it abuts the denuded toeslope which grades directly to the tributary at the west end of the terrace. The burned rock midden (Feature 1) does not extend across the drainage to the southern terrace. Within this terrace, sparse cultural materials were recovered from the surface to 60 cm in Test Unit 4.

Sediments and Stratigraphy

The profile of Test Unit 4 was divided into two zones separated by a 10-cm-thick lens of fairly dense gravels. The upper zone is a 30-cm-thick, dark grayish brown clay loam; the lower zone is a 20-cm-thick, dark brown silty clay. Both zones contained a low density of dispersed small gravels.

Cultural Materials

The sparse cultural materials recovered from Test Unit 4 consist of 1 adze, 1 scraper, 2 cores, 17 pieces of unmodified debitage, and 18 small angular burned rocks. Most of the materials were found at 10–40 cm, but no discrete occupational layers could be discerned.

Discussion

Unlike the northern terrace, the gravelly alluvial sediments comprising the southern terrace represent a high-energy depositional environment that was not conducive to long-term habitation of site preservation. This interpretation is supported by the excavation results, which indicate that the southern terrace contains few cultural materials and no features or subsistence remains. A large portion of the terrace has been disturbed by heavy machinery, and evidence of recent disturbance was found in the upper 20 cm of Test Unit 4.

41BL181

Site Setting

Site 41BL181 consists of a rockshelter facing south-southeast and a portion of the Manning surface immediately above the shelter (Figure 14). The shelter, formed a few meters below the escarpment rim, overlooks an unnamed tributary of Owl Creek to the south. The escarpment face is steep near the shelter and tributary but slopes moderately along the remainder of the canyon rim. Densely vegetated with juniper and scrub oak, the upland surface is bisected by an overgrown unimproved road. The site elevation is 250 m above mean sea level.

Previous Work

On 2 October 1977, Thomas (Fort Hood Archeological Society) recorded the site as a shelter measuring 15x10x4 m. Flakes, mussel shells, bone fragments, and recent trash were observed. A possible burned rock midden near the mouth of the shelter and nearby springs were noted. Although the deposits were considered shallow, test excavations were recommended.

On 22 June 1984, Ensor and Wright (Texas A&M University) revisited the rockshelter and enlarged the site boundary to include the surrounding upland. The shelter, with an estimated 50 percent of its deposits disturbed by pothunting and recent camping, contained buried cultural materials. Thin (20 cm) talus soils were present at the shelter's entrance. A lithic scatter and a thin soil were noted on the upland

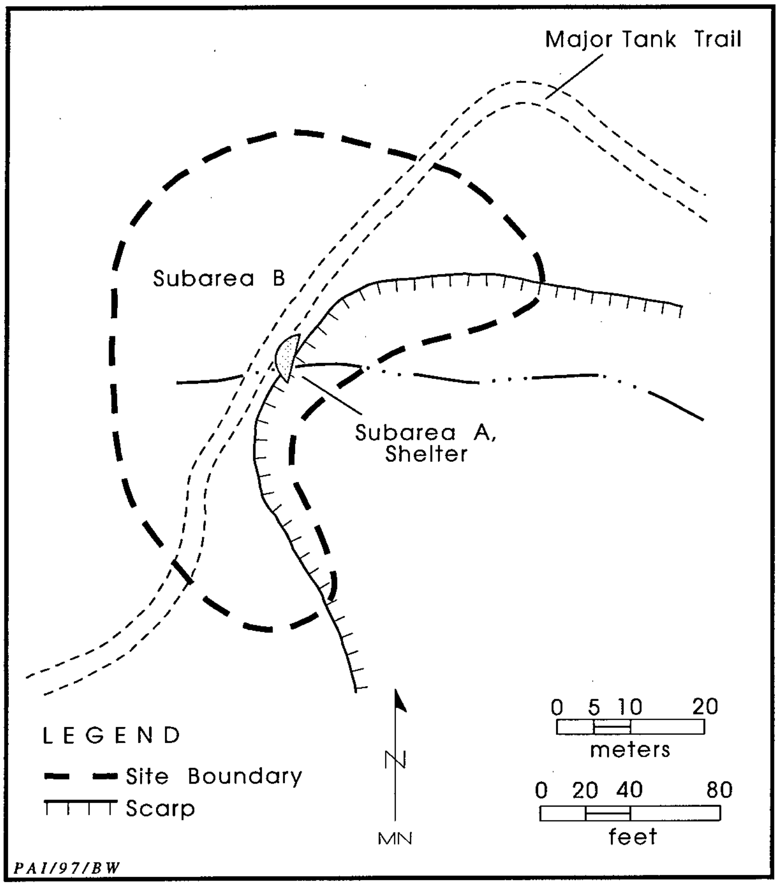

Figure 14. Site map of 41BL181 (modified from a field map from the 1984 site form).

high. The 1984 site map depicted a "sinkhole" near the center of the overhang, which was actually a vertical opening in the center of the ceiling that is visible from the upland surface. The rear of the shelter contained exposed limestone and a very thin disturbed silt loam matrix. Shelter deposits, estimated to be 1 m thick, were present from just inside to approximately 10 m beyond the dripline. These sediments formed a flat talus platform at the mouth of the shelter which graded into the colluvial slope to the south-southwest. This area had been heavily vandalized, and large potholes were present. Two wire-mesh screens, a few 5-gallon buckets, and bottled water with stamped dates of 24 July 1992 indicated that much of the vandalism was recent. Two historic dates of 1868 and 1927 (or 1929?) etched into the shelter wall suggested that the shelter has a long history of vandalism.

surface above the shelter to the west.

On 8 September 1992, Mehalchick and Frederick (Mariah) revisited and reevaluated the site. The site was divided into Subarea A (the shelter) and Subarea B (the uplands) based on differential geomorphic context and archeological potential. Subarea B consisted of the Manning surface above the shelter, which exhibited severe and active sheet erosion. Thin remnants of an older soil were present in discontinuous and shallow bedrock depressions where A-R and Bt-R profiles were observed. Lithic debitage was scattered across this denuded surface, but the potential for intact cultural deposits was considered nonexistent. On this basis, no further work was recommended for Subarea B.

The shelter (Subarea A) was located approximately 4 m below the upland surface and measured 10–15 m deep, 12–15 m wide, and 3–4 m

Examination of the deposits exposed in the potholes and backdirt piles indicated that three types of sediment were present. Deposits beneath the overhang were characterized as an ashy silt loam containing numerous limestone gravel fragments. Deposits outside the dripline consisted of a very angular, gravelly clay loam. In a few places, the previously noted clay loam rested on an angular, gravelly argillic clay horizon (Bt). All deposits except the Bt horizon contained abundant cultural materials consisting of mussel shells, unburned bones, bifaces, hammerstones, a uniface, scrapers, a drill fragment, debitage, a metate fragment, and a mano. In addition, pieces of patinated window glass and aqua bottle glass were exposed in these same deposits. Burned rocks, charcoal, an ashy matrix, and numerous heat-treated flakes were observed near the northeast margin of the shelter. Some of these materials were probably once associated with

features. Three points (a Cliffton, an Ellis, and a Castroville) and a limestone sinker were collected. A computerized inventory sheet of prehistoric artifacts listed a prehistoric ceramic sherd as previously collected from this site, but no mention or location of the sherd was given in any of the site records (it is unknown if this is a coding error or an omission on the part of the recorders). Since Subarea A had the potential for intact cultural deposits, shovel testing was recommended.

On 30 September 1992, a crew excavated two shovel tests in Subarea A. One shovel test was excavated at the northeast edge of the shelter in an area that appeared to be undisturbed. Historic and prehistoric artifacts were found from the surface to 40 cm, and immovable limestone rocks halted the excavation at 45 cm. The second shovel test was placed adjacent to a pothole near the center of the platform at the mouth of the shelter. Prehistoric artifacts were recovered at 0–30 cm, with no intrusive historic materials noted. Due to the presence of large rocks, excavation was terminated at 30 cm. Although Subarea A had been extensively vandalized, the potential for in situ cultural deposits of unknown significance still existed. A minimum testing effort of 2 m^2 of manually excavated test pits was recommended to assess NRHP eligibility (Trierweiler, ed. 1994:A78–A84).

Work Performed

Formal testing of Subarea A, the rockshelter, was completed in September 1995 (Figure 15). Test excavations included three 1x1-m test units. A total of 2.9 m^3 was manually excavated.

Just beyond the edge of the overhang at the northeast margin of the shelter, Test Unit 1 was placed adjacent to a pothole and oriented to 354°. A 45-cm-deep, previously excavated shovel test was encountered in the northeast quadrant of the test unit. As indicated by the earlier shovel test, the upper 50 cm of deposits were completely disturbed based on the presence of numerous historic and modern items. This vandalized fill was removed and not screened, but diagnostic artifacts were collected. Due to the presence of large boulders and rocks, excavation was terminated at 110 cm. Test Unit 2 was placed near the southwest margin of the shelter just beyond the overhang on a section of the gently sloping platform and oriented to magnetic north. Bedrock was encountered across the unit at 16–35 cm. Test Unit 3 was located on the talus slope approximately 4 m downslope (south) of Test Unit 2 adjacent to a pothole. The test unit was oriented to 343°, with bedrock encountered at a maximum depth of 90 cm.

Extent and Depth

Maximum shelter dimensions are 15.6x8.8x2.7 m, with a naturally formed opening (60 cm in diameter) near the center of the roof (see Figure 15). Visible on the upland surface, this opening would allow rainfall to enter the shelter. This, coupled with active seeps along the back wall, appear to be the primary agents flushing the shelter of sediments. Devoid of soil, approximately 80 percent of the shelter floor exposes bedrock. At the northeast edge of the shelter, a 4-m^2 area is the only section within the overhang where preserved sediments and cultural materials were observed. At least half of this deposit has been vandalized, and a large backdirt pile is adjacent to this area.

The relatively level talus platform at the mouth of the shelter slopes moderately to steeply toward the south. The maximum dimensions of the talus deposits are 20 m east-west and 9 m north-south. This area also has been severely vandalized, with 30- to 60-cm-deep potholes exposing dense quantities of cultural materials. The determination of the looters is evidenced by the systematic cutting of large roots from a stand of oak trees located in the center of the heavily disturbed talus.

Spring seeps are located within the shelter and nearby along the base of the escarpment. Below the interface of the overhang and the vertical escarpment near the southwest margin of the shelter, the bedrock has been modified to form a small spring water catchment basin (see Cultural Features). Within the shelter, surface visibility is excellent. Vegetation consists of maidenhair ferns and moss along the back wall. Oaks, grasses, and limestone spalls are present on the talus. Leaf litter obscures some of the surface, but visibility is good in the vandalized areas.

Cultural deposits are restricted to the talus, which encompasses 180 m^2. Due to extensive and intensive vandalism, the majority of the deposits containing prehistoric materials lack contextual integrity. The only undisturbed sediments

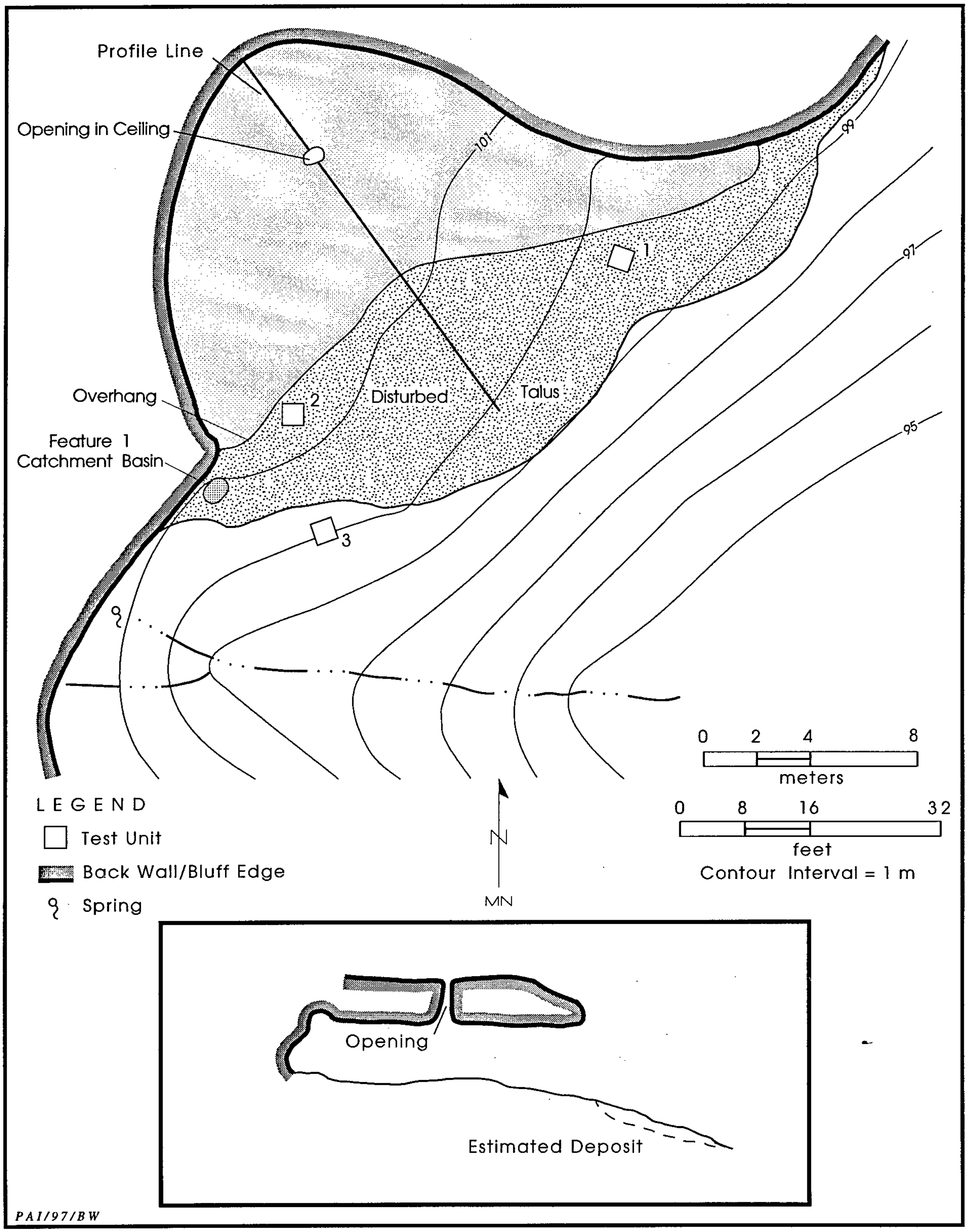

Figure 15. Shelter plan (modified from Trierweiler, ed. 1994:A79) and profile, 41BL181.

were encountered in Test Unit 1 at 50–110 cm and in Test Unit 3 at 40–90 cm. Cultural materials were found throughout these deposits, with artifact frequencies generally decreasing with depth.

Sediments and Stratigraphy

Stratigraphic profiles of Test Units 2 and 3 are described in detail (see Appendix B). The profile of Test Unit 2 revealed a thin (14–35 cm) A-Bt profile. The 5-cm-thick A horizon consisted of a black silty clay loam, while the Bt horizon consisted of a very dark grayish brown clay loam.

Depths and dimensions of the soil horizons and the stratigraphic zones varied across Test Unit 3 due to the gradient of the talus slope. Overall, the thickness of the colluvial mantle ranged from 22 cm in the north wall of the unit to 61 cm in the south wall. One soil (A-Bt) has formed on this mantle and consists of a 10-cm-thick, black silty clay loam A horizon underlain by a very dark grayish brown clay loam Bt horizon, which overlies bedrock.

Cultural Materials

Of the 23 levels excavated in Test Units 1–3, 12 (52 percent) contained historic and modern items. The upper 50 cm of sediments in Test Unit 1 were clearly vandalized deposits. Only one diagnostic artifact, a Scallorn point, was collected, but bones, mussel shells, burned rocks, and abundant debitage were observed in the disturbed deposits. Intrusive modern materials also were found in the upper 35 and 40 cm of deposits in Test Units 2 and 3, respectively. The presence of modern glass and metal artifacts may indicate a high degree of bioturbation; however, these sediments did not appear to be reworked by vandalism, and all prehistoric cultural materials were collected. The remains consist of 1 unburned bone fragment, 27 burned rocks, 1,412 flakes, and numerous stone tools. Diagnostic artifacts include an arrow blank, an untyped dart point, and a Marshall point (Table 8).

Only the lower deposits in Test Unit 1 (50–110 cm) and Test Unit 3 (40–90 cm) appeared to be intact. Cultural materials recovered from these levels include 23 burned and unburned bone fragments, 1 unmodified mussel shell valve, 20 burned rocks, 1,669 flakes, and numerous stone tools. Temporally diagnostic artifacts recovered from undisturbed sediments in Test Unit 1 consist of an untyped arrow point and a Zephyr point from 50–60 cm and an Ensor point from 70–80 cm.

Cultural Features

Just beyond the southwestern limit of the shelter, a water catchment basin (Feature 1) is

Table 8. Artifacts recovered from shelter, 41BL181

	Disturbed Contexts			Undisturbed Contexts	
Artifacts	Test Unit 1 (0–50 cm)	Test Unit 2 (0–35 cm)	Test Unit 3 (0–40 cm)	Test Unit 1 (50–110 cm)	Test Unit 3 (40–90 cm)
Arrow points	1	0	1	1	0
Dart points	0	2	0	2	0
Perforators	0	0	0	1	0
Adzes	0	1	2	4	0
Knives	0	1	0	7	0
Scrapers	0	4	2	10	0
Choppers	0	0	2	1	0
Gravers	0	0	1	2	0
Multifunctional tool	0	0	0	1	0
Miscellaneous bifaces	0	0	1	5	0
Miscellaneous unifaces	0	2	1	8	1
Cores	0	0	1	3	0
Unmodified Debitage	0	853	559	1,427	242
Totals	1	863	570	1,472	243

*Only diagnostics were collected from disturbed sediments in Test Unit 1.

located below a presently active spring. The base of the escarpment and three large tabular pieces of limestone define the feature's perimeter, which measures approximately 70x40 cm (Figure 16). The rectangular shape suggests that the 25–30 cm deep basin was excavated to trap spring water. The time of its construction and use are not known, and it is unclear whether it is a prehistoric or historic feature.

Figure 16. Feature 1 at the southwestern margin of the shelter at 41BL181, facing west.

Discussion

Over many years, the shelter and its talus have been extensively vandalized. Ahtough no evidence of vandalism was noted in 1977, the cultural deposits were 50 percent destroyed by 1984. The most recent vandalism occurred after July 1992, as evidenced by dated plastic trash discovered by Mariah's reconnaissance survey crew in September of that year. Although there are some lower layers of intact cultural materials between the vandalized deposits, it is estimated that well over 90 percent of the site's cultural deposits are now destroyed. Even some of the seemingly intact upper deposits contain modern metal and glass as evidence of bioturbation (or vandalism from long ago?). The temporally diagnostic artifacts recovered from the undisturbed lower levels of Test Unit 1 provide evidence of Late Archaic to Late Prehistoric occupations, but these may be largely inseparable. Most of the site's cultural deposits have been destroyed, and those that remain are of questionable contextual integrity.

41BL579

Site Setting

Site 41BL579 is located on an upland Manning surface between Taylor Branch and Cowhouse Creek (Figure 17). The vegetation grades from dense junipers and oak brush across the eastern two-thirds of the site to dense patches of junipers and open expanses of grasses at the western margin. Trees and brush have been cleared at the western edge of the site, and numerous trails are present throughout the scattered juniper patches. This area of the site is frequently used for military training and by vehicles, while the densely forested portion has only been disturbed by sheet erosion and bioturbation. A minor stream transects the center of the site and flows eastward into an incised valley at the head of which three rockshelters (designated Shelters A–C by previous investigators) are located (see Figure 17). Site elevation ranges from 245 to 260 m above mean sea level.

Previous Work

On 29 February 1984, Gray and Ensor (Texas A&M University) initially recorded this site as an extensive upland lithic scatter (480 m east-west by 280 m north-south) with associated rockshelters. Eight dart points were collected from the lithic scatter: one Pedernales, one Darl, one Godley, and five untyped. Artifacts observed on the upland surface included debitage, bifaces, spokeshaves, and widely scattered burned rocks. The greatest concentration of these artifacts, most being finished stone tools, was in and around a chert field. The rockshelters were plotted on the site sketch map but were not discussed in the notes. The site was estimated to be 55 percent disturbed by roads, erosion, and vehicular traffic. Based on its large size (more than 75,000 m^2),

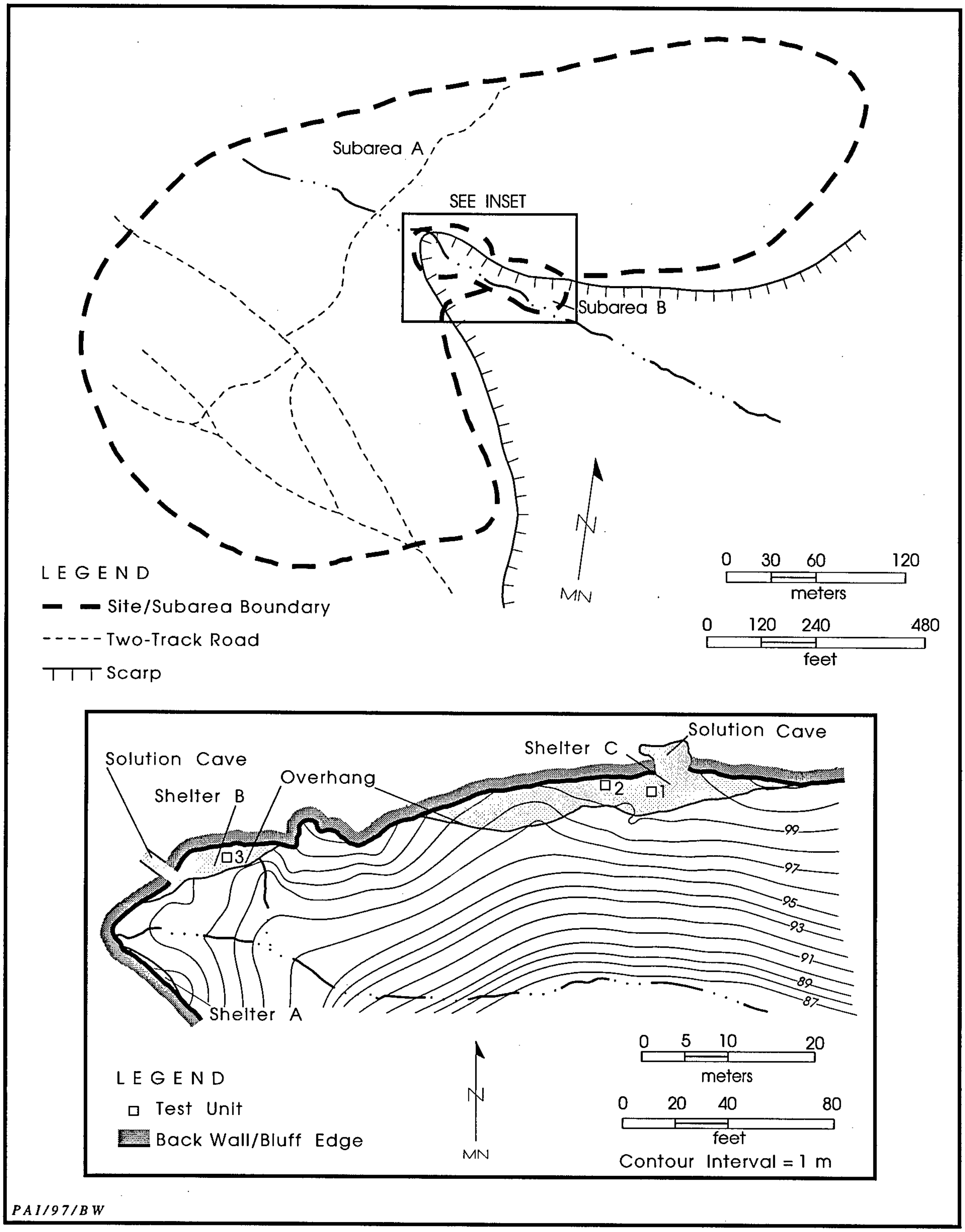

Figure 17. Site map of 41BL579 (modified from Trierweiler, ed. 1994:A317) and detailed area map of Shelters A–C.

the site was classified as a lithic resource procurement (LRP) site for management purposes.

On 10 February 1993, Abbott and Kleinbach (Mariah Associates) revisited the site and redefined the site boundaries to 480 m east-west by 240 m north-south. Based on geomorphic and archeological observations, the site was divided into Subareas A (upland) and B (rockshelter/cave complex). The western half of Subarea A contained a low density of flakes, finished bifaces, and burned rocks and was littered with chert nodules. The finished tools in this area were apparently not manufactured from these chert nodules. The eastern half of Subarea A contained areas with high densities of chert cobbles and debitage representative of all stages of lithic reduction. Subarea B consisted of a series of three closely associated rockshelters (designated as Shelters A–C). Shelters B and C each contained a solution cave that extended into their back walls. The thickness of fill in the shelters was estimated to vary from a few centimeters to at least 50 cm.

On 18 February 1993, a crew excavated four shovel tests in Subarea B. A shovel test excavated to bedrock at 45 cm in Shelter A was culturally sterile. Another sterile shovel test was excavated to bedrock at 30 cm just outside of the cave entrance in Shelter B. The cave was explored with flashlights; numerous historic etchings and recent graffiti were observed on the walls of a room at the end of the cavity, some dating to the early 1900s. The silt that covered the floor appeared to be minimally disturbed, but a shovel test was not excavated due to the presence of a bat colony. However, a shovel test was excavated to bedrock in the solution cavity that led to the back room. Small bone fragments, burned rocks, and charcoal chunks were recovered. Shelter C was investigated with a shovel test excavated to bedrock at 30 cm. One flake and one mussel shell fragment were found at 10–20 cm. The solution cave in Shelter C was explored and no cultural materials or deposits were observed. Shovel testing results indicated that all of the shelters had low research potential, with the exception of the cave located at the back of Shelter B. The back room of this cave contained the potential for intact deposits of unknown significance. A minimum testing effort of 1 to 2 m^2 of manually excavated test pits was recommended to assess NRHP eligibility of the cave within Shelter B (Trierweiler, ed. 1994:A316–A321).

On 18 May 1993, Abbott and Kleinbach (Mariah Associates) revisited the site to evaluate the potential utility of Subarea A (upland) to address issues concerning lithic procurement activities. Chert and impact zones were identified, mapped, and described, and samples of unmodified chert were collected. On 24 May 1993 a crew resurveyed impact zones judged not to be totally disturbed. Based on the resurvey results, Subarea A was considered insignificant and ineligible for listing in the National Register of Historic Places since it lacked contextual integrity and the artifact assemblage would not provide useful data concerning lithic procurement issues. No further management was recommended for Subarea A (Trierweiler, ed. 1994:A316–A321).

Work Performed

Formal testing of Shelters B and C at 41BL579 was completed on 10 August 1995. Although only the cave in Shelter B was recommended for further work, the deposits within Shelters B and C were dry, internally derived sediments that appeared to be potentially intact. Thus, further investigations also were conducted in Shelters B and C. Three 1x1-m test units (Test Units 1–3) and a 50x50-cm test unit (Test Unit 4) were excavated to bedrock. Test Unit 3 was placed in the center of Shelter B and excavated to 40 cm, and Test Unit 4 was placed in the back room of the solution cave and excavated to 50 cm. In addition to the subsurface investigations, all of the recent and historic etchings on the Shelter B solution cave walls were sketched, photographed, and videotaped. In Shelter C, Test Unit 1 was placed in front of the entrance to its solution cave atop a slightly mounded area of deposits (i.e., possible vandal's spoil pile) and excavated to 60 cm. Test Unit 2 was placed along the back wall and excavated to 40 cm.

Shelter B

Extent and Depth

Shelter B, measuring 11x4x5 m, is situated just east of the knickpoint at the head of the incised valley (Figure 18). The surface of the shelter is devoid of vegetation, although several large tree roots have encroached into the deposits. A solution pipe extends approximately 10 m

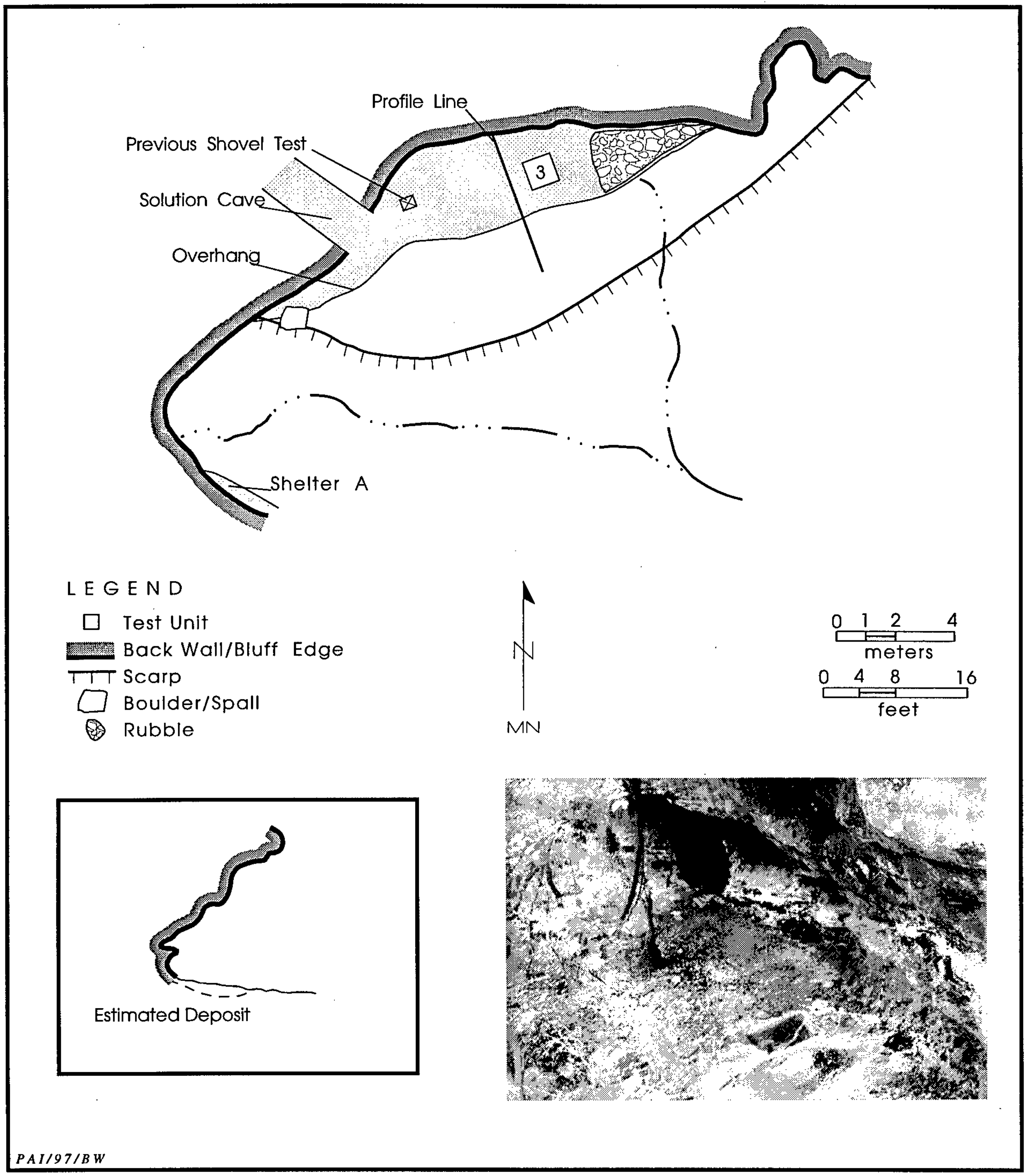

Figure 18. Photograph, plan, and profile views of Shelter B, 41BL579. Photograph view is southwest.

into the back wall and eventually opens into a room measuring 5x3x2 m (Figure 19). Cultural materials are shallow (0–20 cm) in the thin shelter deposits (ca. 40 cm); no cultural materials were found in the 50-cm-thick deposits in the solution cave.

Sediments and Stratigraphy

The stratigraphic profile of Test Unit 3 (see Appendix B) is consistent with Abbott's (1994b: 343) interpretation that Shelter B contains

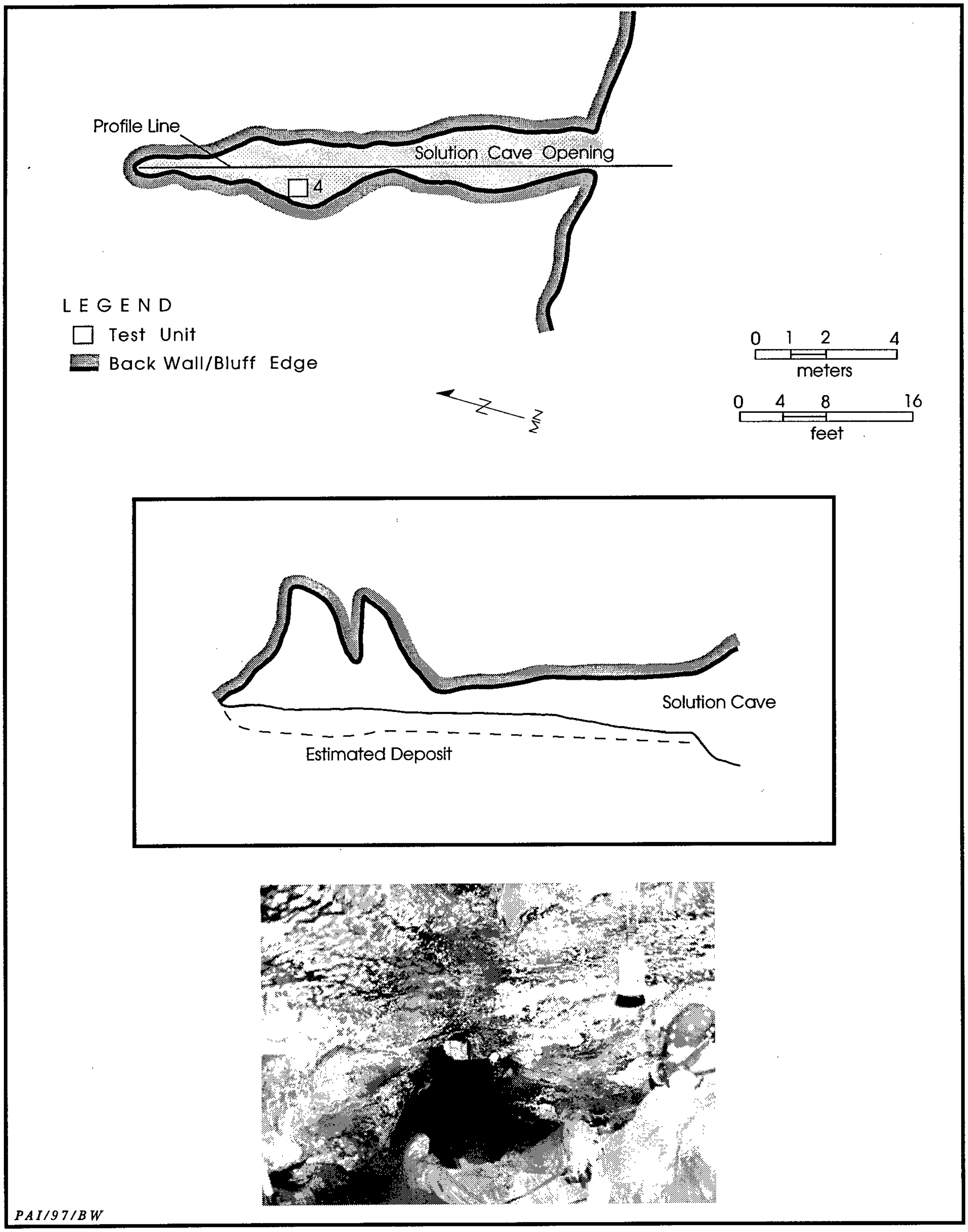

Figure 19. Photograph, plan, and profile views of solution cave at Shelter B, 41BL579. Photograph view is from inside the large cavity looking south out the entrance.

Type 1 fill. The internally derived silt deposits are thin (5 to 9 cm thick), dark grayish brown and very pale brown in color, and contain many small spalls. A 31-cm-thick zone of grayish brown silt and very coarse spalls derived from weathered bedrock underlies the silt deposits.

The fill inside the Shelter B solution cave is composed of a 40–50-cm-thick reddish brown clay loam derived from the erosion of upland soils nearby. These sediments were introduced through solution pipes at the rear of the cave.

Cultural Materials

Very few cultural materials were recovered from Shelter B. Total recovery consists of one untypeable arrow point and two pieces of unmodified debitage from the shelter deposits (Test Unit 3) and a single bone from the solution cave sediments (Test Unit 4).

Historic Etchings

A total of 44 etchings was recorded from the walls of the solution cave. Of these, only five provide a complete calendar-year date of historic age (i.e., over 50 years old): MB 1882, HHF 1924, EHJ 1925, V.S. 1933, and SRS 1940. The majority (n = 28) consist of a series of letters (presumably name initials) and/or symbols. Of the 11 remaining, 4 appear to be complete last names prefixed with first and middle initials, 5 appear to be only first names, and 2 others probably represent only last names.

Discussion

The sediments in Shelter B have been extensively disturbed by bioturbation and erosion. The recovered untypeable arrow point implies occupation during the Late Prehistoric period. However, the extremely limited artifact assemblage suggests that this episode was very brief. No cultural features or subsistence evidence (i.e., organic remains) were discovered.

No cultural evidence was found in the deposits in the back room of the solution cave. The single bone is from a medium-sized mammal and was most likely introduced into the cave by natural processes. The recording of the historic etchings within the Shelter B solution cave effectively exhausts the historic research potential of this shelter.

Shelter C

Extent and Depth

Shelter C is located along the base of the escarpment 20 m east of Shelter B. It is the largest of the three shelters, measuring 47x5x6.5 m (Figure 20). Sediments are restricted to an area measuring approximately 20x3 m along the back wall of the eastern half of the shelter. These sediments exhibit evidence of reworking from sheet erosion, bioturbation, and a possible vandal hole. The western half of the shelter has been flushed of sediments due to precipitation runoff from the upland. Sparse cultural materials were found throughout the deposits excavated at 0–60 cm in Test Unit 1 and 0–40 cm in Test Unit 2.

Sediments and Stratigraphy

The sedimentary fill observed in the profile of the test units reflects Type 1 shelter fill as defined by Abbott (1994b:341). This internally derived fill is light gray, gray-brown, yellowish brown, or tan silt with variable amounts of coarse limestone spalls. The shelter fill in Test Unit 1 is 50 cm thick, overlies weathered limestone bedrock, and can be divided into two zones (see Appendix B). The uppermost zone consists of a 25-cm-thick, structureless pale brown silt with many spalls, while the lower zone is a 25-cm-thick, structureless very pale brown silt with many spalls (up to cobble sized).

Cultural Materials

Materials recovered from Shelter C include, from Test Unit 1, a total of 28 flakes, 9 bone fragments, and 1 burned rock; and from Test Unit 2, 4 flakes, 1 uniface, 1 burned rock, and 1 mussel shell. The cultural materials were fairly evenly distributed throughout all levels.

Discussion

Shelter C was previously investigated and recommended as ineligible for listing in the National Register (Trierweiler, ed. 1994:A316–A321). Current investigations support this judgment in that no stratigraphically discrete cultural components or features were identified. Of the few bone fragments recovered, some have been highly weathered and gnawed by animals

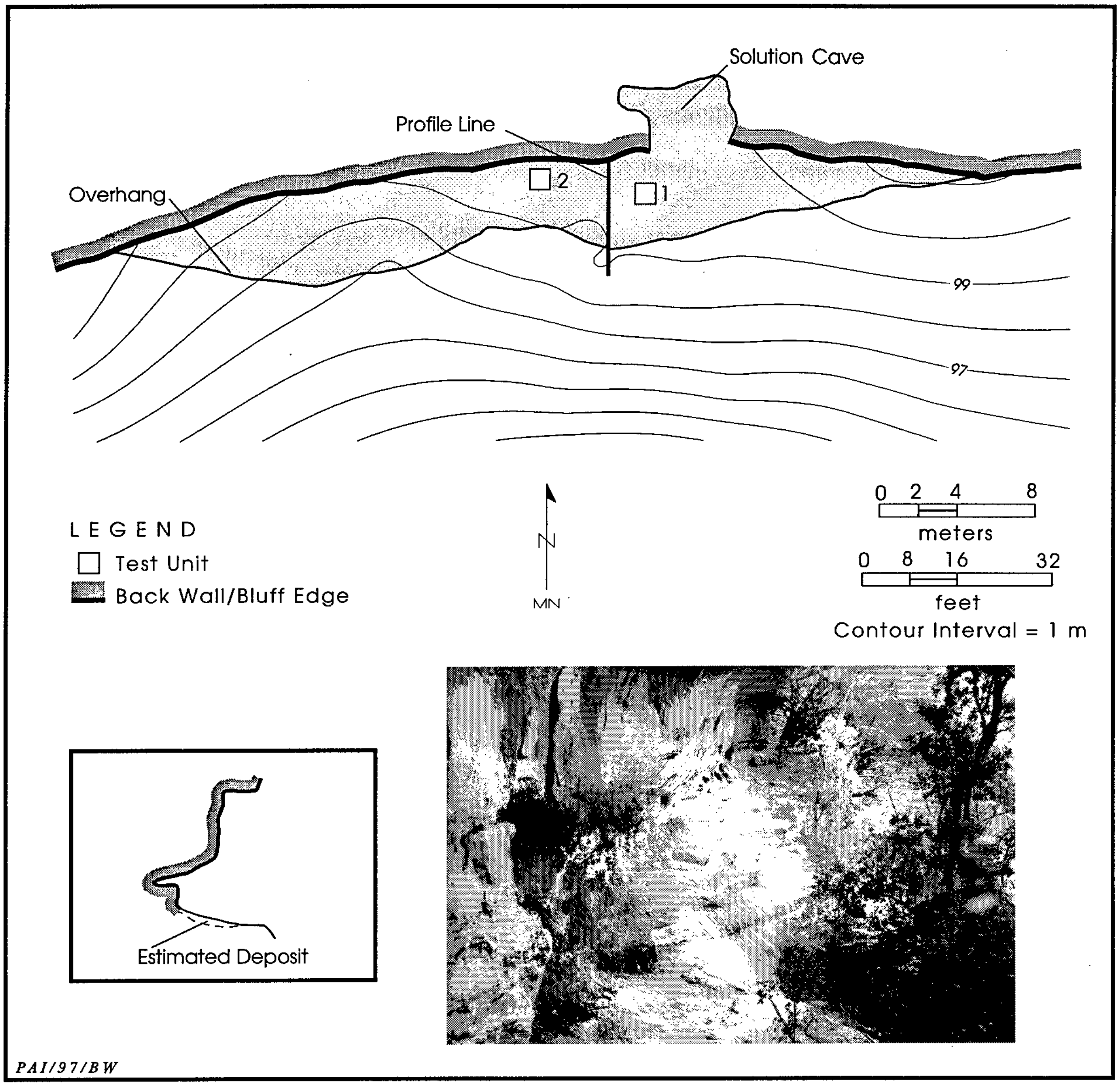

Figure 20. Photograph, plan, and profile views of Shelter C, 41BL579. Photograph view is east.

and are most likely incidental to any cultural occupations. The research potential of Shelter C is considered to be extremely low; meager artifact recovery and the lack of contextual integrity due to bioturbation indicate that further archeological investigations would not be productive.

41BL581

Site Setting

Site 41BL581 is located on an upland Manning surface between Taylor Branch and Cowhouse Creek. The site contains an upland lithic scatter and two rockshelters situated at the head of an unnamed, east-flowing tributary of Taylor Branch (Figure 21). The upland surface exhibits extensive bedrock exposures that are highly disturbed by sheet erosion. The vegetation on the upland grades from a scattered juniper and oak forest across the northern two-thirds of the site to a dense juniper forest along and surrounding a small drainage at the southern margin. This drainage has formed a

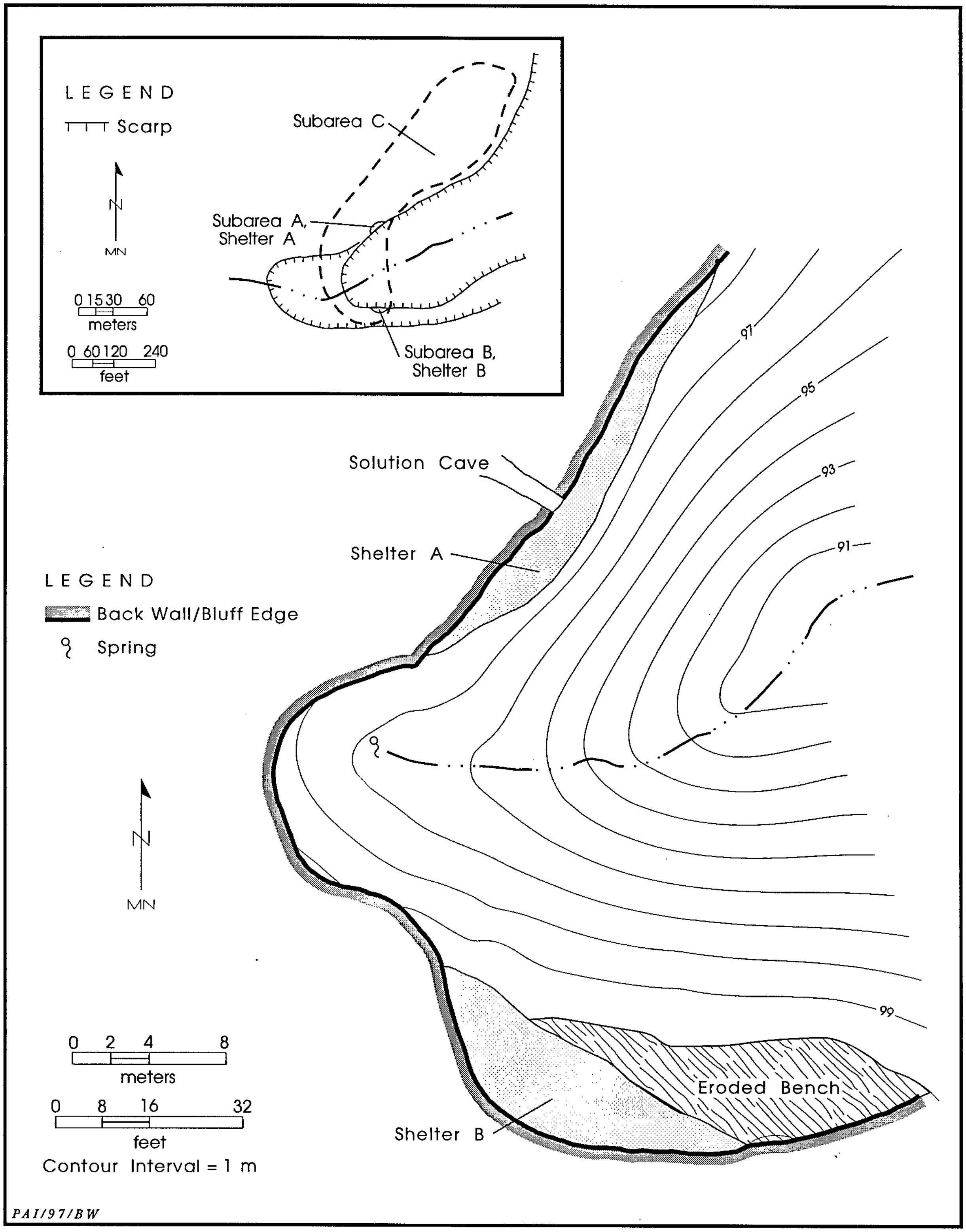

Figure 21. Site map of 41BL581 (modified from Trierweiler, ed. 1994A:323) and detailed area map for Shelters A and B.

knickpoint in the escarpment, at the base of which is an actively flowing spring surrounded by maidenhair ferns. The two rockshelters are located on opposite sides of the spring. Site elevation ranges from 245 to 255 m above mean sea level.

Previous Work

On 1 March 1984, Gray and Ensor (Texas A&M University) recorded this site as an upland lithic scatter with two associated rockshelters. Site dimensions were defined as 240x60 m, with the site's long axis oriented northeast-southwest. Debitage, bifaces, burned rocks, and mussel shell fragments were observed on the upland surface. Shelters A and B, situated on the north and south sides of the spring, respectively, were not discussed in the notes, but the sketch map of Shelter B indicates that animal bones were observed. The site was estimated to be 25 percent disturbed by erosion.

Oglesby and Doering (Mariah Associates) revisited the site on 12 March 1992. The site was divided into Subarea A (Shelter A), Subarea B (Shelter B), and Subarea C (the upland) based on geomorphic observations and the potential for intact cultural deposits. Site dimensions remained the same as those defined by the previous investigators.

Shelter A, located north of the spring, measured approximately 38x2x3 m. The sediments in this shelter were noted as being derived from weathered limestone roof-fall, and the talus slope in front was steep and actively eroding. A small number of animal bones observed on the shelter's floor were thought to be recent, and the deposits showed no evidence of vandalism. The sediments and talus slope at Shelter B were similar to those at Shelter A. Two flakes, three burned rocks, and recent animal bones were observed on the shelter floor, but no disturbances were noted. Based on the potential for Shelters A and B to contain intact deposits, both were recommended for shovel testing.

Subarea C included the uplands above and northeast of the shelters. No further management was recommended for this area because it was judged to lack potential for stratified cultural deposits.

On 3 April 1992, a crew excavated one shovel test in each shelter. Both were culturally sterile. Bedrock was reached at 40 cm in Shelter A, and either bedrock or a large roof spall was encountered at 27 cm in Shelter B. Based on testing results, Shelter A was considered to have a limited research potential and no further work was recommended. Since the shovel test in Shelter B was inconclusive regarding the depth of sediments, the potential for deeper cultural deposits of unknown significance remained. A minimum testing effort of 2 to 3 m^2 of manually excavated test pits was recommended to assess the NRHP eligibility of Shelter B (Trierweiler, ed. 1994:A322–A323).

Work Performed

Formal testing of Shelter B at 41BL581 was completed on 8 August 1995. Two 1x1-m test units were manually excavated. Test Unit 1, placed in the center of Shelter B and oriented to 320°, was excavated through a lens of burned and/or naturally reddened rocks (Feature 1) to immovable spalls at 90 cm. Because of the low ceiling, it was not feasible to excavate a unit farther back in the shelter; consequently, Test Unit 2 was placed contiguous with the north wall of Test Unit 1 to further investigate Feature 1. Test Unit 2 was excavated to immovable spalls at 85 cm.

Extent and Depth

Shelter B is situated just south of the spring. The maximum dimensions of the shelter are 30x5x2.6 m, although the only apparent appreciable deposits are confined to a 17x4-m area behind a line of large roof-fall boulders which extends across most of the shelter (Figure 22). With the exception of some faunal and erosional impacts, these deposits are largely undisturbed. Although consolidated bedrock was not reached, large spalls encountered at the base of the test units are thought to lie directly on or very near the bottom of the shelter. Definite cultural artifacts were recovered from 40–50 cm, and potential cultural materials (i.e., possible burned rocks) were found at 50–90 cm.

Sediments and Stratigraphy

An examination of the stratigraphy of Shelter B shows that the shelter fill consists of Type 2 and Type 4 sediments as defined by Abbott (1995b:833–837). Type 2 sediments consist of

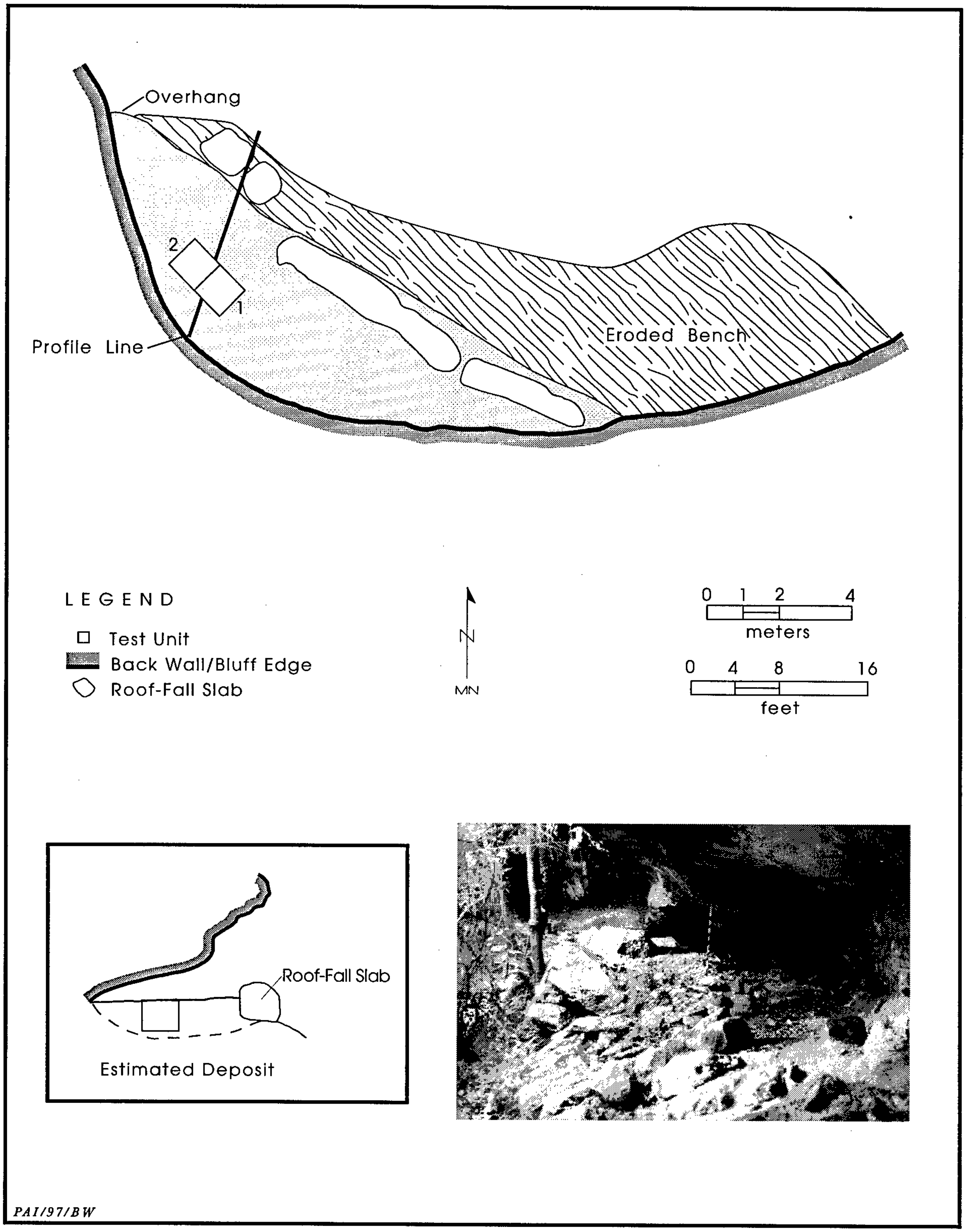

Figure 22. Photograph, plan, and profile views of Shelter B, 41BL581. Photograph view is southeast.

multicolored, weathered, internally derived silts with variable amounts of coarse spalls. Type 4 sediments are characteristically comprised of reddish brown to red clay loam to stony clay loam that, if structureless, is probably derived from eroded upland Bt soil horizons. However, Abbott (1995b:836–837) has recently noted that if this type of shelter fill exhibits a strong angular blocky structure and/or color change with depth, the fill may represent an in situ Bt horizon of some antiquity.

The 90-cm-thick profile of Test Unit 1 can be divided into three zones (see Appendix B). Zone 1 (A horizon) is a 28-cm-thick dark brown silty clay with many small spalls. At the base of Zone 1, extremely large limestone slabs (roof fall) have virtually sealed in the underlying Zone 2, which is a 23-cm-thick 2Bt horizon consisting of a subangular blocky structured reddish brown clay loam with many spalls, up to and including boulder-sized spalls. It is believed that the 2Bt horizon has been truncated based on the observation of a large pedestal of similarly colored and structured soil preserved under a large boulder or slab of limestone (roof fall) southeast of the test units. Zone 3 (2C horizon) consists of a 39-cm-thick brown to dark brown silt with a few roots and many spalls, up to and including boulder-sized spalls.

The A horizon (Zone 1) is characteristic of Type 2 rockshelter fill. Its age is not known due to a lack of radiocarbon assays and temporally diagnostic artifacts. Abbott (1995b:836) has interpreted Type 2 fill as a Type 1 fill that has been "substantially and differentially altered by redox reactions due to periodic groundwater discharge and/or intense heating, incorporation of cultural detritus, and variable degrees of weathering." Clearly this geochemical weathering is somewhat time dependent, suggesting that some antiquity may be attributed to the A horizon. While the exact age of the A horizon is not known, it is clearly not associated (depositionally or pedogenically) with the underlying 2Bt horizon. The 2Bt horizon represents the remnant of an ancient soil, the upper part of which has been removed by unknown agents. Charcoal from the 2Bt horizon yielded a conventional radiocarbon age of 10,010 ± 60 B.P. (see Appendix A). This ancient soil formed on internally derived shelter sediments. Preserved remnants of a few roots and root casts in the 2C horizon suggest that the soil-stratigraphic unit supported some vegetation and was relatively stable in the past. Subsequent to truncation, the soil was sealed by roof fall and Zone 1 sediments were deposited.

The artifact assemblage from Shelter B is extremely limited (see below); however, several lines of evidence suggest that a portion of this assemblage is associated with a sealed and partially intact cultural deposit of great antiquity, and therefore of great significance. The conventional radiocarbon age of 10,010 B.P. and the calibrated age of 9708–9059 B.C. show the range of this occupation to be the early Paleoindian period. Geologic and pedogenic evidence also support the presence of a sealed and partially intact cultural deposit of early Paleoindian age.

Abbott (1995b:836–837) has modified some of his earlier interpretations of rockshelter fills at Fort Hood (see Abbott 1994b), particularly those classified as Type 4 sediments. Previously interpreted as exogamous sediments derived from the erosion of ancient upland Bt soil horizons, recent investigations by Abbott (in Trierweiler 1996) at 41BL504 and the current investigations have revealed that some rockshelter fills interpreted as Type 4 exhibit blocky structure and/or color variation with depth, suggesting that the sediments may represent a Bt horizon. If developed in situ within internally derived sediments (i.e., predominantly silts weathered from the limestone ceiling and walls), some antiquity must be attributed to the Bt horizon because the weathering, formation, and illuviation of clays are relatively slow processes and primarily time-dependent (Birkeland 1984:205). This is particularly true in most limestone shelters, since few clays are initially present in the unweathered silty shelter deposits. Clays, most likely smectites, are available through the weathering of the shelter sediments and are translocated down-profile over time. An extended period of time also may be inferred from the rubified nature of the 2Bt horizon. Although other factors, such as climatic conditions, can lead to rubification (Birkeland 1984:211), the combination of rubification, advanced soil structure, and illuvial clays is suggestive of considerable antiquity.

Based on these observations, it is no longer prudent to instinctively describe all such rockshelter sediments (Type 4) at Fort Hood as exogamous and/or of middle to late Holocene age, particularly if such pedogenic characteristics are present. If some Type 4 sediments are in fact Bt

horizons formed in internally derived sediments, one may consider such pedogenic features as extremely weathered illuvial horizons formed in ancient Type 1 and/or Type 2 sediments. Evidence of such a soil/stratigraphic unit relationship comes from the 2Bt-2C horizons (Zones 2 and 3). The 2C horizon is more indicative of Type 2 fill but appears not to be a separate depositional unit. Sometime after the upper part of the solum was truncated, the early Paleoindian component was sealed by a major roof collapse episode.

Although evidence of burning is definitely present within the early Paleoindian cultural deposit (i.e., burned bone and charcoal were recovered), it cannot at this time be conclusively determined whether the reddish color of the spalls and rocks at the bottom of Zone 2 (2Bt horizon) and in Zone 3 (2C horizon) are the result of cultural burning or a natural weathering process (i.e., oxidization of ferrous materials within the limestone). The same elements resulting in the rubification of the 2Bt horizon are likely to be responsible for at least some of the reddish color of the spalls (since both are ultimately derived from the same source, the limestone ceiling and walls of the shelter) rather than cultural burning. This is just one aspect of Shelter B that warrants further investigation.

Cultural Materials

A relatively sparse assemblage of materials was found in the rockshelter during testing. Recovered faunal remains include one unmodified mussel shell umbo and 61 bone fragments; the mussel shell and 44 of the bones were found in the upper 30 cm of sediments (i.e., Zone 1), while 17 bone fragments were found in the lower deposits at 30–90 cm (i.e., Zones 2 and 3). The faunal remains, which are discussed in more detail in Appendix C, are of considerable interest, particularly those from the lower shelter deposits that are of late Pleistocene age. Notably, all of the bones exhibiting evidence of rodent gnawing were found in the upper levels. Spiral-fractured specimens were found in both the upper (n = 10) and lower (n = 5) zones, while burned specimens were found only in the lower zones (n = 2). The faunal assemblage from the lower levels also is of considerable interest because muskrat (*Ondatra zibethicus*) remains were recovered (their significance is discussed in Appendix C).

The only chipped stone artifacts, one scraper found in Test Unit 1 and one uniface manufacturing or resharpening flake found in Test Unit 2, were recovered from the 2Bt horizon at 40–50 cm. Also observed within this same level were dispersed chunks of charcoal, a few small burned rocks in both test units, and a thin ash lens at 42–46 cm in the west wall of Test Unit 1. A charcoal sample collected at 38–45 cm in Test Unit 1 near the contact of the 2Bt and 2C horizons (i.e., Zones 2 and 3) yielded a conventional radiocarbon age of 10,010 ± 60 B.P. A large number of reddish rocks found in the lower 2C horizon (Zone 3) may be burned and were designated as Feature 1 (discussed below).

With respect to the faunal remains from the lower levels, it is not certain whether the spiral fractures and burning are due to cultural or natural processes. As Baker notes in Appendix C, natural processes can generate spiral fractures and burned bones; the evidence on the faunal remains is inconclusive. However, given their association with possible burned rocks, scattered charcoal, and two lithic artifacts, the case for cultural involvement is strengthened.

Cultural Feature

A single feature was recorded. Feature 1 is classified as a burned rock concentration, although many of the rocks composing it may be naturally discolored. The feature slopes slightly to the southeast from Test Unit 2 into Test Unit 1. For the most part, the concentration is contained within the 2C horizon, Zone 3 (Figure 23), but a few of the rocks were found near the bottom of the 2Bt horizon (Zone 2). The feature extends into all walls of the test units, and although an exact measurement could not be attained, this feature could represent a more or less continuous rock layer extending across most or all of the shelter. A total of 339 discolored rocks, weighing 179 kg, was recovered from the feature, and they appeared to be fairly evenly distributed across both test units. The rocks composing the feature varied from small (ca. 2 cm diameter) angular fragments to large (up to 30x16x12 cm) blocky pieces of roof spall. The majority of the rocks were various shades of red, with a few of the smaller ones being a grayish hue; however, many rocks were only partially discolored (externally and/or internally) and

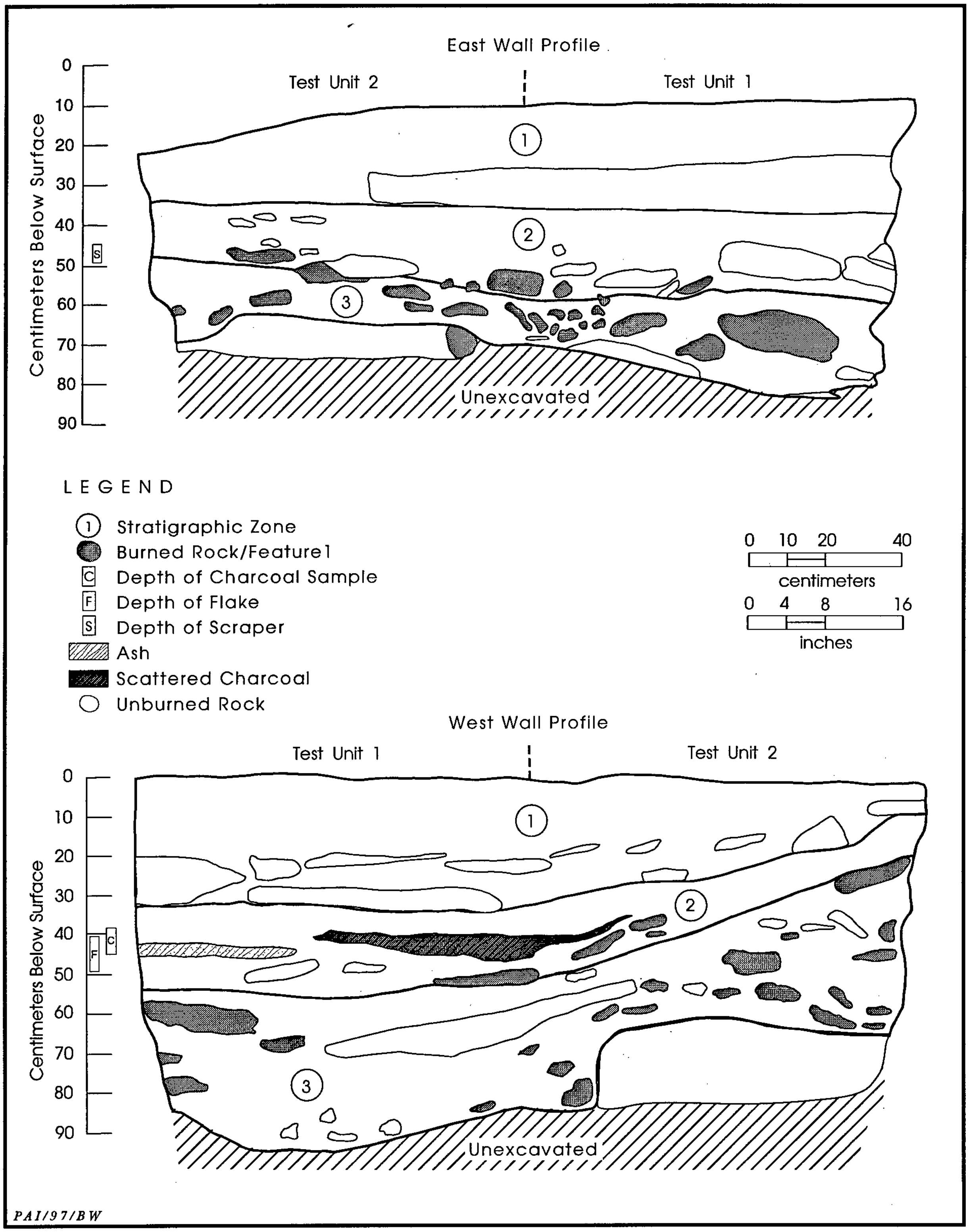

Figure 23. East and west profile views of Test Units 1 and 2 in Shelter B, 41BL581.

some were not discolored at all. Of note, the rockshelter's limestone walls and ceiling are naturally tan or yellowish in color, and a few spalls on the surface of the eroded west end of the shelter exhibited a thin red rind on their exterior. It appears that the rocks found in the test units, all of which appear to be roof spalls of the same material, exhibit more-intensive reddening with depth. Not only do they exhibit thicker red exterior rinds, but deeper specimens also exhibit moderate to intensive reddening of their interiors. Although it is not certain how much of this weathering is due to burning (i.e., the Feature 1 rocks in Zone 3), at least some of the reddening is thought to be due to pedogenic alteration. In contrast, many of the smaller roof-fall fragments are more angular and exhibit gray discoloration that is most likely due to burning associated with cultural activities. The two lithic artifacts, two burned bones, and chunks of charcoal found scattered among and just above the Feature 1 rocks suggest that cultural burning is likely to have contributed to their discoloration.

Discussion

The single radiocarbon age, obtained on charcoal from the 2Bt horizon, indicates that the lower deposits in Shelter B at 41BL581 are of late Pleistocene age. From the same and lower levels, more scattered charcoal, numerous possible burned rocks, two burned bones, and two lithic artifacts were recovered and observed. Collectively, this evidence suggests an ephemeral occupation of the shelter during the Paleoindian period. These lower deposits are sealed below and behind a major roof collapse episode, and the large roof-fall blocks along the shelter's dripline have protected these sediments from erosion. In all likelihood, these deposits would have been scoured out long ago if the roof-fall blocks were not present. The great antiquity of these cultural deposits is extremely significant because this is the earliest occupational evidence yet found in a rockshelter at Fort Hood, and such evidence is rare throughout Central Texas.

41BL582

Site Setting

Site 41BL582 is located on an upland surface (Figure 24) overlooking the Cowhouse Creek valley to the south. The site contains a sparse upland lithic scatter and two rockshelters. The upland is vegetated by a scattered juniper and oak forest and has been highly impacted by sheet erosion and military vehicular traffic. A small drainage forming a knickpoint in the escarpment is located just east of the site. An active spring, surrounded by ferns, emerges at the base of the knickpoint. Both rockshelters (designated Shelters A and B) are situated at the base of the escarpment, west of the spring. Site elevation is 250 m above mean sea level.

Previous Work

On 1 March 1984, Gray and Ensor (Texas A&M University) recorded this site as a low-density upland lithic scatter with two rockshelters below the escarpment edge. The shelter nearest (ca. 10 m southwest of) the spring was designated Shelter A, with the more distant one being labeled Shelter B. Burned rocks, a few mussel shells and flakes, and one biface were observed in Shelter A. The deposits within Shelter A were estimated to be 40–50 cm thick, and an estimated 5 percent of the shelter had been disturbed by erosion. A few flakes, one mussel shell, and one bone were observed in Shelter B. No evidence of vandalism was present in either shelter.

On 11 March 1992, Oglesby and Doering (Mariah Associates) revisited and reevaluated the site. Based on geomorphic and archeological observations, the site was divided into Subarea A (Shelters A and B) and Subarea B (upland). Site dimensions were defined as 70 m east-west by 50 m north-south. Within Shelter A, sediments had apparently accumulated through weathering of the limestone roof and walls. This fill appeared to be intact, although evidence of recent camping was observed. The deposit was estimated to be at least 50 cm thick. Cultural materials were observed on the shelter floor and on the sloping talus in front of the shelter. Within Shelter B, internally derived sediments were estimated to be 30 cm thick, but no cultural materials were observed. Based on the potential for both shelters to contain intact, buried cultural deposits, shovel testing was recommended.

Because cultural materials observed on the upland were judged to be on an erosional surface, Subarea B was considered to have no potential for buried cultural components. No further management was recommended for Subarea B.

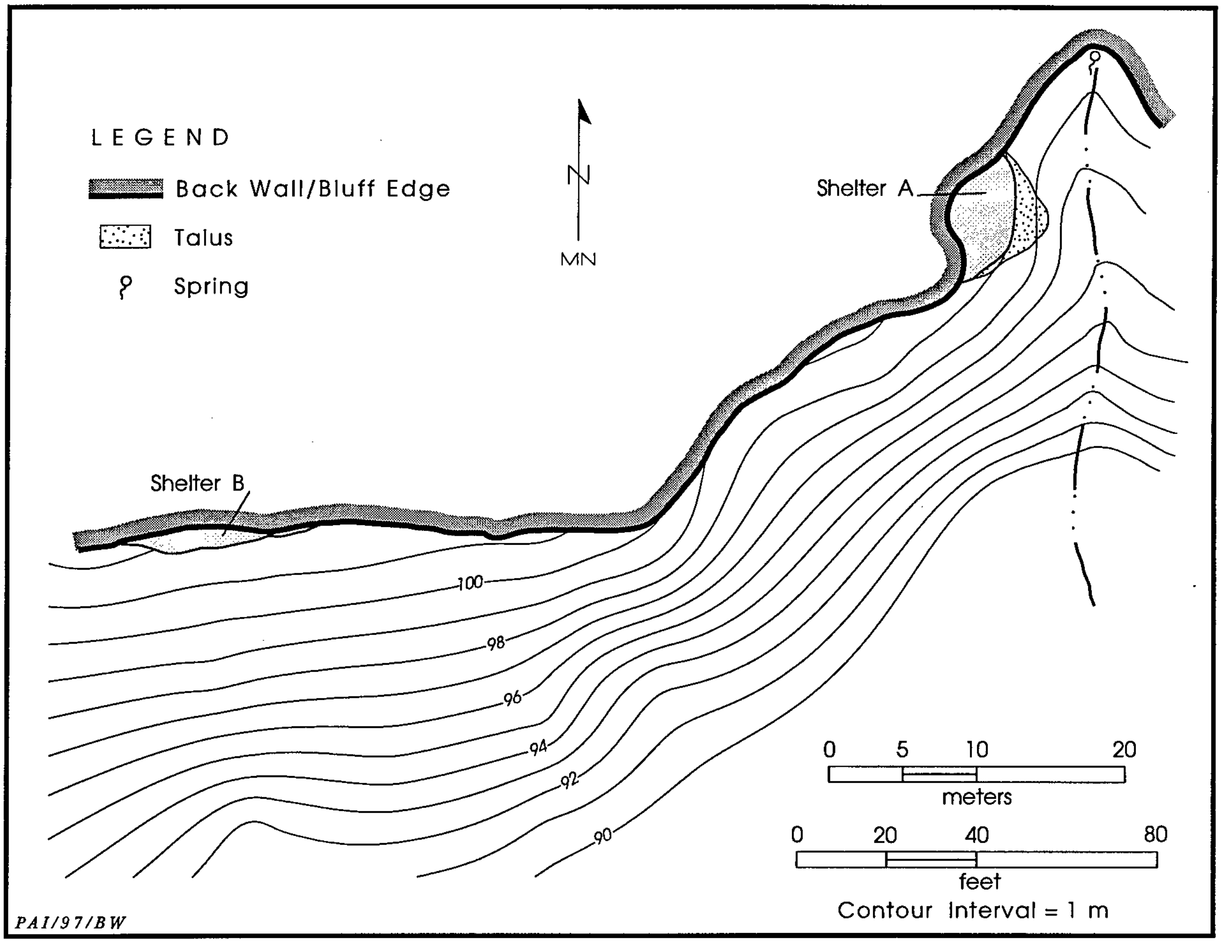

Figure 24. Map of Shelters A and B, 41BL582.

On 6 April 1992, a crew excavated one 50x50-cm test quad to 30 cm in Shelter A and one shovel test to 40 cm in Shelter B. In Shelter A, four flakes, seven mussel shell fragments, and seven burned rocks were recovered at 0–20 cm. The test in Shelter B was culturally sterile. However, shovel testing results did not provide conclusive evidence that bedrock was encountered in either shelter. Therefore, both shelters possessed potential for intact cultural deposits of unknown significance below the level of testing. A minimum testing effort of 2 to 4 m^2 of manually excavated test pits within each shelter was recommended to assess NRHP eligibility (Trierweiler, ed. 1994: A324–A325).

Work Performed

Formal testing of Shelters A and B at 41BL582 was completed in August 1995. Three 1x1-m test units were manually excavated. In Shelter A, Test Unit 2 was placed at the front edge of the internally derived sediments and excavated to immovable spalls at 80 cm, and Test Unit 3 was placed farther into the shelter ca. 1 m west of Test Unit 2 and excavated to bedrock at 70 cm. Test Unit 1 was placed in the center of Shelter B and excavated to bedrock at 50 cm.

Shelter A

Extent and Depth

Shelter A, situated adjacent to the spring, measures 7x4.7x4.8 m (Figure 25). A narrow talus extending to the spring-fed drainage channel has developed in front of the shelter's dripline, but no appreciable accumulation of

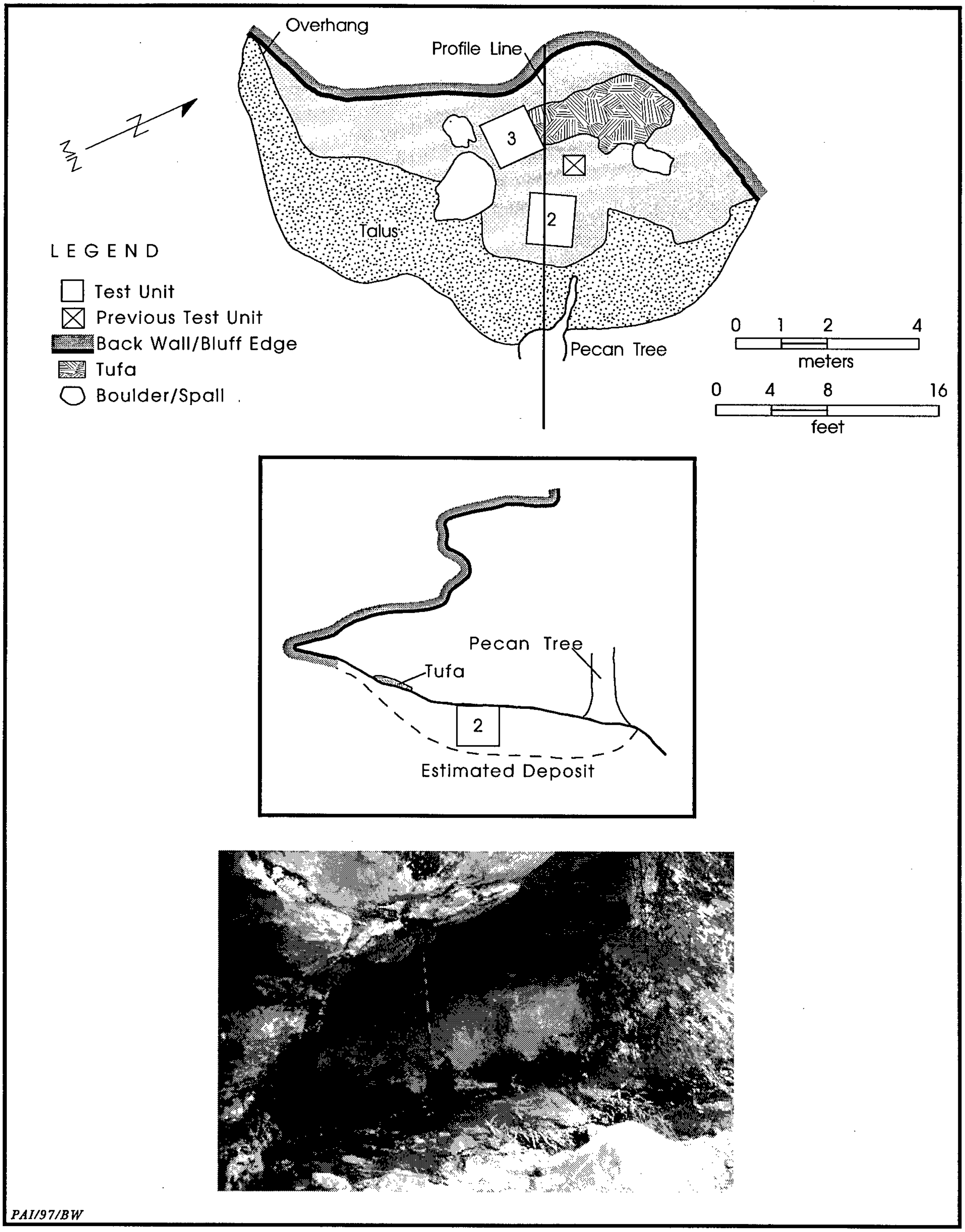

Figure 25. Photograph, plan, and profile views of Shelter A, 41BL582. Photograph view is north.

sediment is present. The shelter sediments are devoid of vegetation; however, a few ferns are growing out of the back wall and a large pecan tree is situated near the middle of the talus. A tufa deposit covering a ca. 1x3-m area continues to develop across the northwest quadrant of the shelter. The internally derived sediments in Shelter A increase in thickness from the back wall to the dripline. Cultural materials were found to a depth of 60 cm near the back wall and 80 cm at the front of the shelter.

Sediments and Stratigraphy

The profile of Test Unit 2 is indicative of Type 1 rockshelter fill but includes some minor tufa and travertine (flowstone) deposits. This profile is divided into three zones (see Appendix B). The upper 47 cm is a very dark grayish brown silt with many spalls, up to and including pebble sized. It overlies a 12-cm-thick grayish brown silty clay with many spalls, up to and including cobble sized. The basal zone is a 26+-cm-thick grayish brown silty clay loam with many spalls, including a few that are boulder sized.

Cultural Materials

The diverse artifact assemblage recovered from Shelter A (Table 9) includes 3 dart points, 3 chipped stone tools, 171 pieces of unmodified debitage, and 2 pieces of ground stone. In addition, 22 unmodified and unburned mussel shells (10 from Test Unit 2 and 12 from Test Unit 3), 132 bones (15 of which exhibit spiral fractures or burning; see Appendix C), and approximately 40 kg of burned rocks were recovered. The majority of the burned rocks (34 kg) were found in Test Unit 2, and the overwhelming majority of all cultural materials found in Shelter A were recovered at 0–40 cm. Of the three dart points, a Darl was found at 0–10 cm and two untypeable specimens were found at 10–20 cm.

Table 9. Artifacts recovered from Shelter A, 41BL582

Artifacts	Test Unit 2	Test Unit 3	Totals
Dart points	2	1	3
Scraper	0	1	1
Chopper	0	1	1
Miscellaneous uniface	0	1	1
Unmodified debitage	104	67	171
Ground stones	1	1	2
Totals	107	72	179

Cultural Features

Within Test Unit 2 at 30–40 cm, 89 (11.75 kg) mainly angular burned rocks concentrated in the southwestern third of the unit were designated as Feature 1. An amorphous scatter of numerous (n = 120+, 9.5 kg) smaller (less than 5 cm) burned rocks was found throughout the unit in the preceding two levels. In addition to the 89 burned rocks (which ranged from small fragments up to tabular pieces 20x14x1.5 cm in size), 2 pieces of debitage, 3 bone fragments, and 2 mussel shells were found within the feature fill, and 82 (7 kg) small scattered burned rocks, 12 flakes, 3 mussel shells, and several large unburned spalls were found in the surrounding matrix. The feature boundary was delimited by a distinct stratigraphic contact between a dry unconsolidated silt (i.e., the feature fill) and a moist silty clay. Because the upper 40 cm of deposits within the unit, including Feature 1, was highly bioturbated, it was not determined whether the feature represents a completely disturbed or partially intact feature (e.g., a hearth), or perhaps a refuse dump of discarded rocks. In any case, the rocks appear to be scattered on a living surface, and charcoal recovered from the feature fill flotation sample yielded a radiocarbon age of 2500 ± 60 B.P. (see Appendix A).

Discussion

Diagnostic artifacts and the radiocarbon date indicate that Shelter A was occupied during the latter part of the Late Archaic period. The calibrated radiocarbon date of 785–427 B.C., obtained on charcoal from Feature 1, coincides with the periods defined as the Pedernales/Kinney and Lange/Marshall/Williams intervals of Collins (1995:Figure 2). The presence of a Darl dart point is somewhat incongruous since this style was used later in time (i.e., after A.D. 500); however, the relatively large amounts of lithic and faunal materials suggest that the shelter was used intermittently over a fairly long period. Although bioturbation has impacted a portion of the deposits and a few recent items were found in Test Unit 2, the majority of the fill in Shelter A appears to be

intact. In addition, the development of a tufa deposit over the sediments in part of the shelter has "cemented" cultural materials in situ. This has created a unique situation in which archeological deposits and paleoenvironmental data coexist in a sealed deposit.

Shelter B

Extent and Depth

Shelter B, situated approximately 60 m west of Shelter A, measures 10x2x2.8 m (Figure 26). Several large spalls cover most of the western half of the shelter, and a limestone shelf is present along the middle portion of the back wall. The overhang provides little protection from erosion, with the dripline being only 1 m from the back wall. Due to the steep slope just in front of the dripline, no talus deposit is associated with this shelter. Sparse cultural materials were found to a depth of 40 cm inside the shelter.

Sediments and Stratigraphy

Although the fill in Shelter B was described by Abbott (1994b:343) as Type 1 sediment, examination of the profile of Test Unit 1 suggests that it is more indicative of Type 3 sediment. Abbott (1994b:341) defines Type 3 shelter fill as dark grayish brown to black clay loam or stony clay loam that is usually externally derived. The 47-cm-thick profile of Test Unit 1 can be divided into three zones (see Appendix B). The upper 21 cm is a black silty clay loam with many spalls, up to and including cobble sized. Zone 2, at 21–33 cm, is a dark brown clay loam with many spalls, up to and including cobble sized. Zone 3 is a 14-cm-thick, brown to dark brown clay loam with many spalls, up to and including pebble sized. These sediments and clasts appear to be derived from upland deposits, transported over the escarpment through sheet erosion. At 47 cm, highly weathered limestone bedrock was encountered.

Cultural Materials

In contrast with the recovery from Shelter A, very few cultural materials were found in Shelter B. Total recovery included one adze and five pieces of unmodified debitage.

Discussion

No intact subsurface cultural components or features were encountered. The thin deposits consist primarily of reworked upland sediments. The shelter has no research potential due to the paucity of cultural materials and the lack of contextual integrity.

SITE 41BL667

Site Setting

Site 41BL667 is a rockshelter situated at the base of a cliff face, 15 m upslope and west of Bull Branch (Figure 27). The southern margin of the shelter is covered with very large rocks that spalled off the face of the cliff. These rocks appear to have once been a continuation of the rockshelter overhang. The talus in front of the shelter has been oversteepened by the addition of a considerable amount of backdirt from extensive vandalism inside the shelter. A narrow terrace (ca. 4 m wide) lies between the base of the valley wall and Bull Branch. Site elevation is 220 m above mean sea level.

Previous Work

Site 41BL667 was first recorded by Gray and Ensor (Texas A&M University) on 27 April 1984 as a highly vandalized rockshelter. Mussel shells, bones, burned rocks, debitage, bifaces, a side scraper, a hammerstone, a mano, and a piece of historic earthenware were observed in the shelter. The site was estimated to be 43 percent disturbed by vandalism and erosion, and the deposits were estimated to be ca. 50 cm thick. However, due to an error during transcription of the original site form, subsequent records listed the site as containing ca. 5 m of deposits. Gray concluded that the shelter appeared to have had a substantial cultural deposit, and that the deep deposits might indicate lengthy and/or repeated occupations.

The site was revisited by Gray and Nordt (Texas A&M University) and Jackson and Smith (Fort Hood) on 5 January 1990 to confirm the reported depth of the deposits. The site was noted to be in the same condition as reported by the original recorders; however, it seemed unlikely that the shelter contained several meters of deposits.

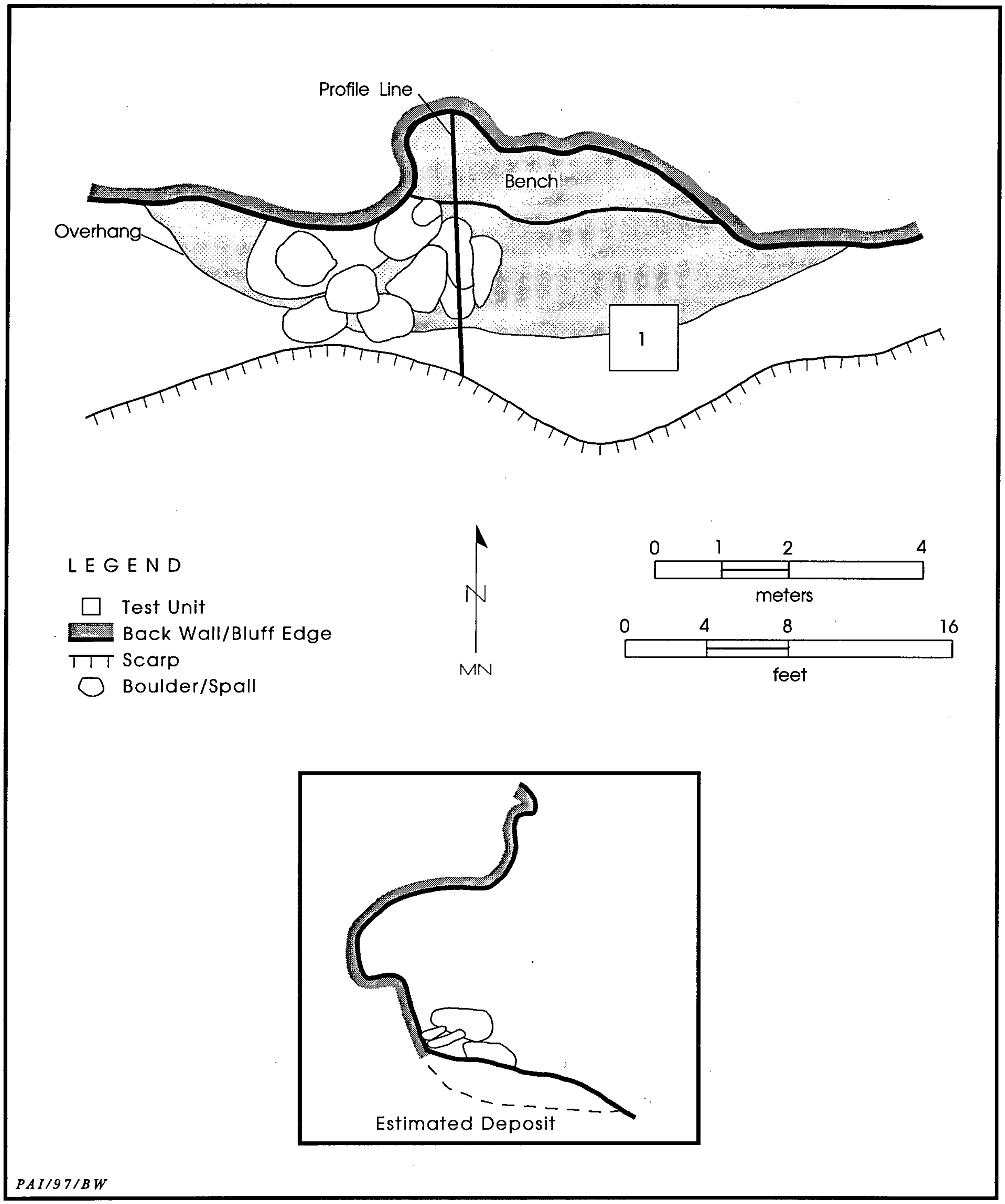

Figure 26. Plan and profile views of Shelter B, 41BL582.

On 29 January 1993, Abbott and Turpin (Mariah Associates) revisited and reevaluated the site. The majority of the shelter's sediments were noted as being either disturbed by old pot-holes or covered by piles of backdirt; however, it was conceivable to the investigators that intact

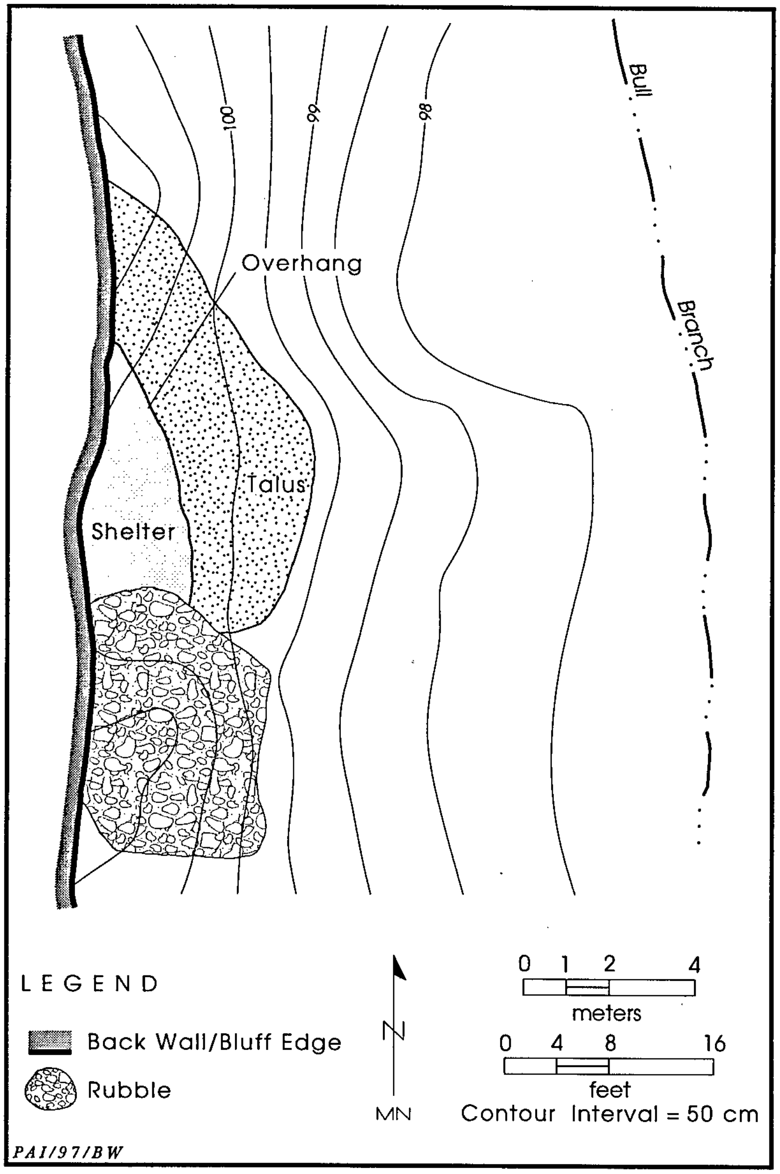

Figure 27. Site map of 41BL667.

deposits were present beneath some of the spoil piles. Chert tools, debitage, ground stone, bones, and mussel shells were observed. A crew returned to the shelter and excavated a 1x1-m unit (Test Pit 1) through one of the backdirt piles to bedrock at 50 cm. Although the upper 40 cm of fill contained a large amount of prehistoric cultural materials, evidence of recent disturbance (i.e., glass and military debris) also was found. No evidence of disturbance was observed at 40–50 cm, where several flakes and a single bone fragment were recovered. Based on these testing results, the researchers concluded that the shelter potentially contained intact cultural deposits of unknown significance. A minimum testing effort of 2 m^2 of manually excavated test pits was recommended to assess NRHP eligibility (Trierweiler, ed. 1994: A388–A393).

Work Performed

Formal testing of 41BL667 was completed in September 1995. Three 1x1-m test units (Test Units 2–4) were excavated, and a total of 2.1 m^3 of sediment was removed. A large spall (1.5 m long by 60 cm wide) located just in front of the shelter's dripline was removed for the placement of Test Unit 2. Boulder encumbrances (i.e., large roof spalls) terminated excavation of the unit at 90 cm. Test Unit 3 was placed along the back wall at the north end of the shelter deposits and was excavated to bedrock at 50 cm. Test Unit 4, located below the talus on the narrow terrace, was excavated to densely packed gravels at 70 cm.

Extent and Depth

The site is an east-facing rockshelter with maximum dimensions of 11 m north-south by 3 m east-west, with a 3.5-m-high overhang (Figure 28). The talus is restricted to the area directly in front of the shelter and extends to the base of the colluvial toeslope. The sediments within the shelter are devoid of vegetation, but scattered hardwood trees are located on the talus. Cultural materials were found to a depth of 50 cm near the back wall and to 90 cm at the dripline.

Sediments and Stratigraphy

Stratigraphic profile descriptions were

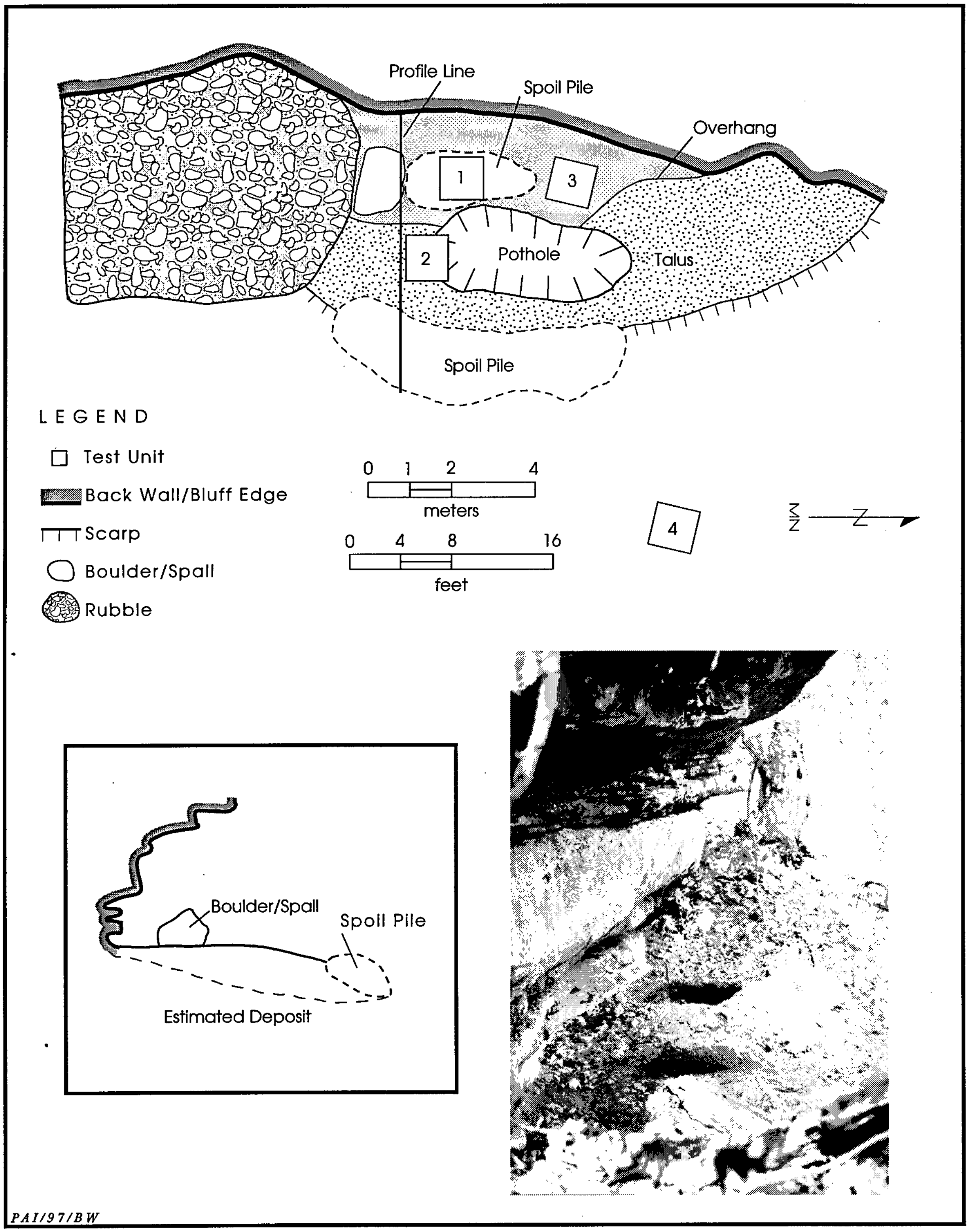

Figure 28. Photograph, plan, and profile views of rockshelter 41BL667. Photograph view is north.

recorded for Test Units 3 and 4 (see Appendix B). The Test Unit 3 profile revealed an internally derived grayish brown silt typical of Type 1 rockshelter fill as defined by Abbott (1994b:341). The 50-cm-thick fill appeared to be very jumbled and mixed; however, two general zones were delineated. The upper zone is a 38-cm-thick, very dark gray silty clay loam with common spalls, up to and including pebble sized. The basal zone is a 12-cm-thick, dark grayish brown silty clay with many spalls, up to and including cobble sized.

In Test Unit 4, a colluvial mantle overlies a gravelly, clayey alluvium. The profile is divided into three zones representing an A-Bt-2C profile. The A and Bt horizons have formed in the toeslope of a colluvial deposit. The A horizon is a 30-cm-thick, very dark gray clay with common small gravels; the Bt horizon is a 15-cm-thick, very dark grayish brown clay loam with common pebble-sized or smaller gravels. The 2C horizon is a 25-cm-thick, yellowish brown gravelly clay loam alluvium deposited at the toe of the colluvial slope. Large amounts of gravels and spalls were recovered from the A-Bt soil, suggesting that the cultural materials within this colluvial deposit are redeposited, having been washed downslope from the talus.

Cultural Materials

The artifact assemblage recovered from the shelter is indicative of repeated occupations over a long period of time. Artifacts recovered include 10 arrow and 4 dart points, 11 tools, 6 cores, and 733 pieces of unmodified debitage (Table 10). Six of the points were classified into the following types: 3 Scallorn arrow points, 1 Fresno arrow point, 1 Darl dart point, and 1 Ensor dart point. Other materials recovered include 22 mussel shells (4 burned), 86 bone fragments, 27 kg of burned rocks, and numerous pieces of recent debris (i.e., glass). Although the majority of the bones are highly fragmented and many exhibit gnawing, a few deer elements and a large Canidae canine tooth were identified. Several human skeletal remains were found in disturbed deposits, but these were not collected (all human remains were returned to the units when they were backfilled). The vast majority of the materials were recovered from vandalized sediments within Test Unit 2 at 0–60 cm and Test Unit 3 at 0–50 cm.

Table 10. Artifacts recovered from 41BL667

Artifacts	Test Unit 2	Test Unit 3	Test Unit 4	Totals
Arrow points	8	2	0	10
Dart points	3	1	0	4
Adze	1	0	0	1
Knives	3	0	0	3
Scrapers	1	1	0	2
Graver	0	0	1	1
Miscellaneous bifaces	3	0	0	3
Miscellaneous uniface	1	0	0	1
Cores	5	1	0	6
Unmodified debitage	402	318	13	733
Totals	427	323	14	764

Discussion

The diagnostic artifacts suggest that the shelter supported intermittent occupations from the latter part of the Late Archaic period to the latter part of the Late Prehistoric period. The dart points may have been recycled by the Late Prehistoric inhabitants, however, which would suggest that the shelter was occupied only during the Late Prehistoric. In any event, previous and present investigations indicate that virtually all accessible deposits within this small shelter have been vandalized. Although a few cultural materials were found within the narrow terrace in front of the shelter, these items were most likely reworked downslope from the shelter's talus. The lack of integrity evident in the deposits indicates that 41BL667 has no research potential.

41BL816

Site Setting

Site 41BL816 is situated on a colluvial slope on the west side of an unnamed, north-flowing tributary of North Nolan Creek (Figure 29). The tributary defines the eastern site boundary, where the colluvial slope grades directly to the drainage. The western (upslope) half of the site is covered with scattered junipers, while the

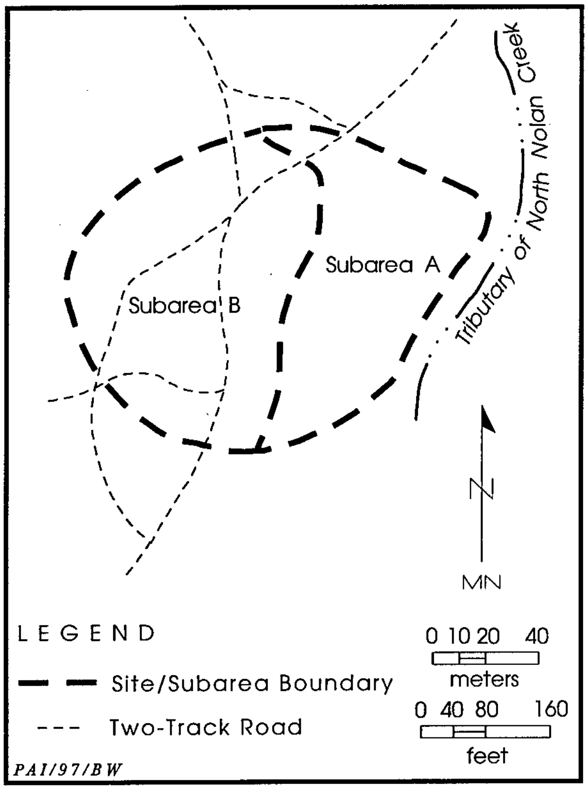

Figure 29. Site map of 41BL816 (modified from Trierweiler, ed. 1994:A525).

eastern half contains small grassy glens that are surrounded by fairly dense clusters of brush and poison ivy which appear to be secondary growth subsequent to juniper clear-cutting. A narrow but dense strip of juniper and oak trees across the middle of the site divides these areas. A frequently traveled military trail parallels the west side of this strip of dense trees. The majority of the site area has been impacted by previous juniper cutting activities; other areas continue to be disturbed by military vehicular traffic and sheet erosion. Site elevation is 230 m above mean sea level.

Previous Work

This site was initially recorded by Rotunno and Strychalski (Texas A&M University) on 28 February 1986 as a lithic and burned rock scatter. Site dimensions were defined as 170 m east-west by 130 m north-south. A moderate surface artifact density was noted, with debitage, scattered burned rocks, bifaces, unifacially worked tools, and a hammerstone observed. Two dart points (one Frio and one Bulverde-like) were collected from the surface. The depth of deposits was estimated to be less than 20 cm, and the western half of the site was noted to be highly eroded. Overall, the site was estimated to be 77 percent impacted by erosion, roads, vehicular traffic, and wild animals.

Frederick and Quigg (Mariah Associates) revisited the site on 23 March 1992. The size of the site was reduced to 140 m east-west by 100 m north-south, and it was divided into Subareas A and B on the basis of geomorphic observations. Subarea A, the eastern half of the site, was observed to contain shallow Pleistocene and Holocene deposits within a colluvial toeslope. A small amount of debitage was observed in an A horizon exposed in the upper 30 cm of a road cut. Scattered burned rocks observed by the previous investigators were judged to be unburned, naturally discolored (weathered) limestone. Based on the foregoing, shovel testing was recommended in Subarea A. Subarea B, the western half of the site, was noted as containing a portion of an eroded slope that exhibited almost complete bedrock exposure. A Martindale point was collected from this surface. Since Subarea B lacked Holocene deposits, subsurface testing was not warranted and no further management was recommended.

On 3 April 1992, a crew excavated nine shovel tests in Subarea A. Eight of the tests were positive, with 16 flakes recovered at depths of 0 to 40 cm. Bedrock was encountered in the majority of these tests at 30–40 cm. Based on the recovery of artifacts from the thin wedge of colluvium, the investigators concluded that Subarea A potentially contained a buried, discrete occupation of unknown significance. A minimum testing effort of 2 to 4 m^2 of manually excavated test pits was recommended to assess the NRHP eligibility of Subarea A, 41BL816 (Trierweiler, ed. 1994:A524).

Work Performed

Formal testing of Subarea A was completed on 26 July 1995. Two backhoe trenches and three 1x1-m test units were excavated (Figure 30). A total of 1.5 m^3 was manually excavated.

Backhoe Trenches 1 (12x0.8x0.9 m) and 2 (12x0.8x1.1 m) were excavated to bedrock in the eastern portion of Subarea A at the interface of

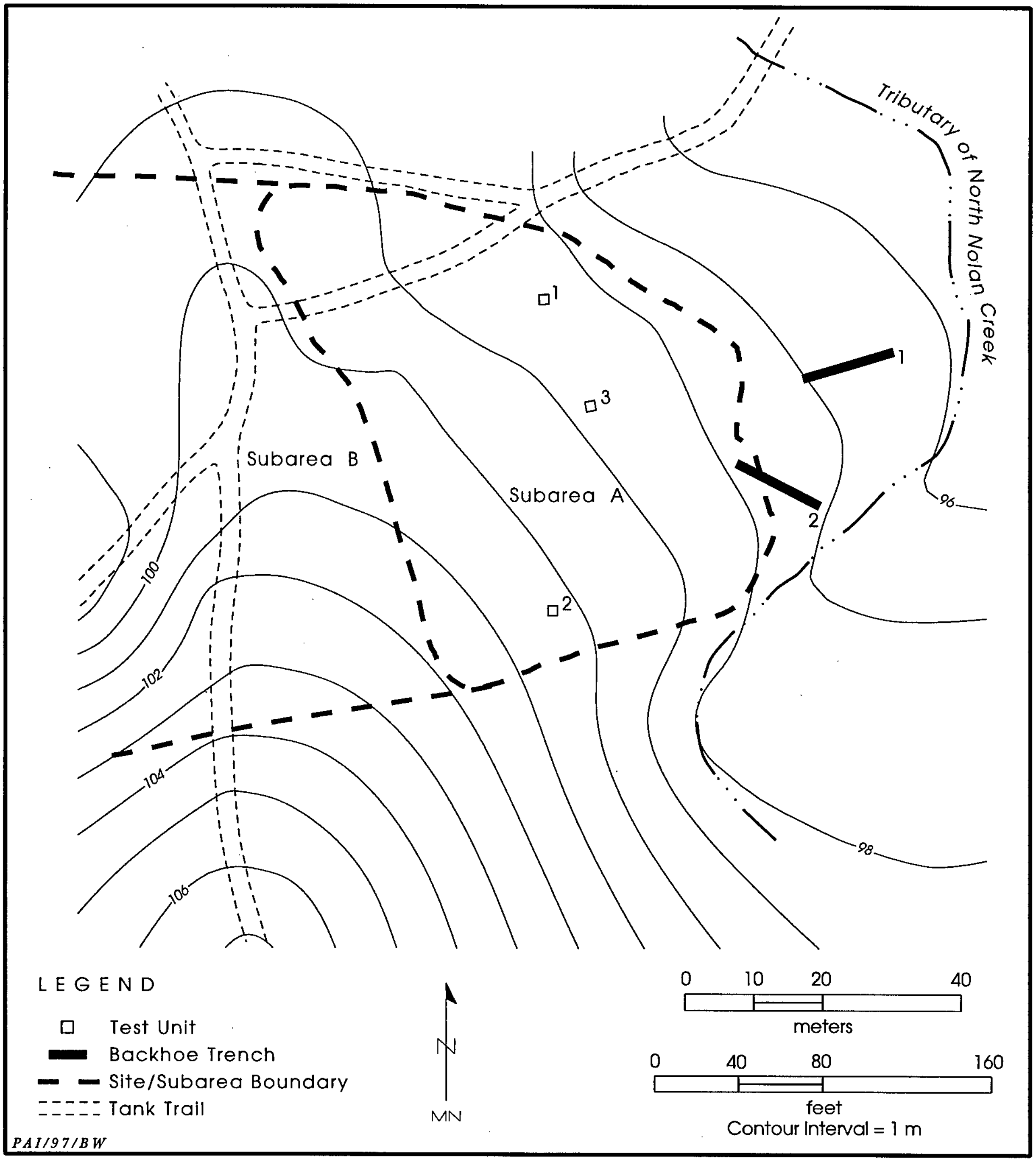

Figure 30. Map of Subarea A, 41BL816.

the colluvial toeslope and the terrace (T_1). Backhoe Trench 1 was oriented to 253° magnetic north, and Backhoe Trench 2 was oriented to 297°. No cultural materials were observed within the trench walls or in the backdirt.

The test units were staggered across the midslope of Subarea A and were excavated to weathered bedrock. Test Unit 1, placed near the north boundary of Subarea A, was excavated to 50 cm. Test Unit 2, excavated to 60 cm, was located at the southern margin of Subarea A. Test Unit 3, situated near the center of the

toeslope approximately 20 m south of Test Unit 1, was excavated to 40 cm. Test Units 1 and 3 were oriented to magnetic north, but Test Unit 2 was oriented to 22° to facilitate excavations among the vegetation.

Extent and Depth

The current investigations were limited to Subarea A, which comprises approximately the eastern one-half of the site. From north to south across the subarea, cultural artifacts were found at 0–40 cm in Test Units 1 and 3 and at 30–50 cm in Test Unit 2.

Sediments and Stratigraphy

Both trenches revealed a poorly sorted, gravelly, Holocene colluvial mantle with one soil imprint (A-C profile) overlying weathered limestone bedrock. Backhoe Trench 1 revealed a 46-cm-thick very dark gray very gravelly clay loam A horizon that thickens downslope (see Appendix B). The underlying C horizon, a 20-cm-thick, very dark grayish brown silty clay loam, also thickens downslope. Each test unit contained moderate to large amounts of colluvial gravels, including unmodified chert nodules.

Cultural Materials

Low frequencies of debitage were recovered from each test unit, including 17 flakes from Test Unit 1, 6 flakes from Test Unit 2, and 15 flakes from Test Unit 3. The only diagnostic artifact is an untypeable dart point recovered from Test Unit 3. No subsistence remains or burned rocks were discovered.

Discussion

Small amounts of lithic debitage and a single untyped dart point (undefined Archaic) are the only artifacts recovered during the present investigation. Within the excavation units, artifacts were fairly evenly distributed vertically, but they occur within a poorly sorted colluvial matrix. In addition to this evidence, the lack of appreciable sediment/soil units upslope (Subarea B) suggests that all of the deposits in Subarea A are probably redeposited by slopewash. Despite the presence of buried cultural materials, these secondary deposits have little or no potential for containing intact features or isolable evidence of discrete occupations.

41BL827

Site Setting

Site 41BL827 is located near the head and on the west side of an unnamed tributary of North Nolan Creek. The site consists of a rockshelter and the sloping talus in front of it (Figure 31). The western boundary of the site is defined by a large limestone exposure, in the base of which the rockshelter and a small alcove have formed. The eastern boundary is defined by the unnamed drainage which abuts the talus's slope in front of the shelter. Several large boulders situated on the talus have trapped a considerable amount of sediments on their upslope sides. The talus is vegetated by scattered cedar elm and juniper trees. Most of the deposits along the back wall of the shelter (i.e., those in the northern two-thirds) and at the base of the talus have been disturbed by vandalism. To a lesser degree, the deposits in the central portion of the talus have been disturbed by vandalism and bioturbation. Site elevation is 220 m above mean sea level.

Previous Work

Rotunno (Texas A&M University) first described this site on 6 March 1986 as a rockshelter with an associated burned rock scatter. Although the site data form described the burned rock feature as a scatter, the site sketch map denoted it as a burned rock midden. Observed cultural materials included debitage, burned rocks, bifaces, and a metate. Although no diagnostics were observed, the chronology of the site was listed as Late Prehistoric, and unspecified cultural materials were collected. The site was noted as containing numerous potholes which had exposed, scattered, and artificially mounded burned rocks. The deposits were estimated to be more than 50 cm thick, but 80 percent of the site appeared to be disturbed by vandalism and erosion.

On 25 March 1992, Doering and Oglesby (Mariah Associates) revisited and reevaluated the site. The rockshelter was designated Feature 1, and maximum site dimensions were defined as 50 m north-south by 30 m east-west.

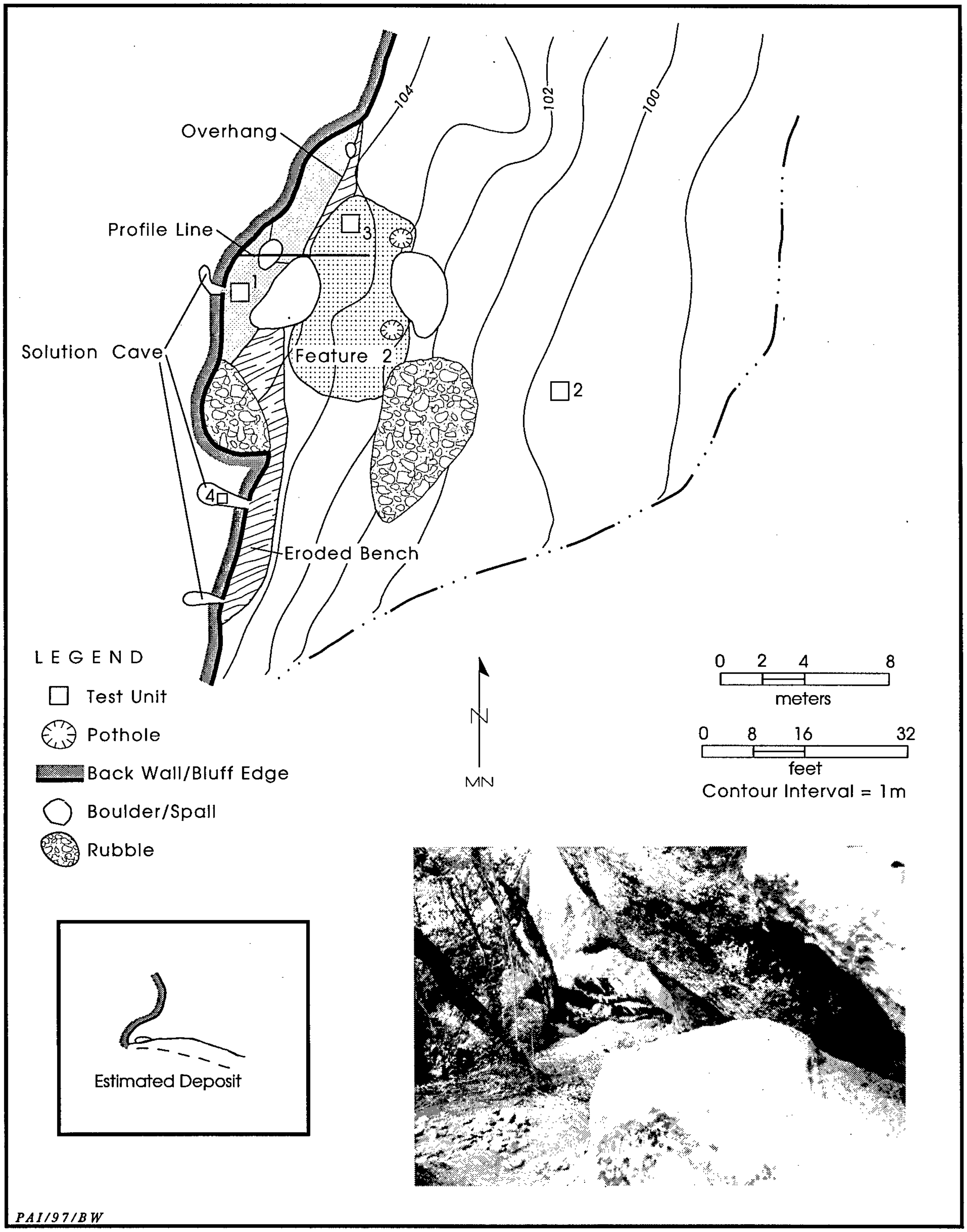

Figure 31. Photograph, plan, and profile views of rockshelter 41BL827. Photograph view is south.

Although no potholes were observed, the deposits behind the dripline did not appear to be intact. The disturbed nature of these deposits was verified by the recovery of prehistoric materials and pieces of recent glass from a 40-cm-deep shovel test. A burned rock midden (designated Feature 2) was observed in potholes on the talus. A shovel test excavated 70 cm into this feature yielded high frequencies of burned rocks and flakes, a burned bone, a biface, and mussel shell fragments. The base of the talus was observed to be the most vandalized area of the site. A third shovel test was excavated to 40 cm in this vicinity, with recovery consisting of a few flakes from each 10-cm level.

The subsurface investigations indicated that the site contained potentially intact cultural deposits of unknown significance. A minimum testing effort of 2 m^2 of manually excavated test pits and a long backhoe trench in front of the shelter were recommended to assess NRHP eligibility (Trierweiler, ed. 1994:A534–A535).

Work Performed

Formal testing of 41BL827 was completed in August 1995. Because the site was inaccessible by backhoe, all testing was done by hand. Three 1x1-m units (Test Units 1–3) and one 50x50-cm unit (Test Unit 4) were excavated. Test Unit 1 was placed within the rockshelter just south of the area containing obviously vandalized deposits. It was oriented to magnetic north parallel with the shelter's back wall and was excavated to bedrock at 70 cm. Test Unit 3, placed on the talus midden (Feature 2) a few meters in front of the shelter, was oriented to 17° and excavated to boulder encumbrances at 90 cm. Test Unit 2, excavated to bedrock at 60 cm, was placed on a relatively level area at the base of the talus and oriented to 24°. Test Unit 4, oriented to magnetic north and excavated to bedrock at 20 cm, was placed in a small alcove located ca. 10 m south of the rockshelter (see Figure 31).

Extent and Depth

The shelter measures 12x2x1.4 m, with only a small area protected beneath the overhang. A large chunk of limestone spalled off the overhang rests at the north end of the shelter. The majority of the sediments behind this boulder and along the back wall across the northern two-thirds of the shelter have been churned by vandals. The deposits in the southern third of the shelter appear to be intact. A presumed solution cavity, located in the southern end of the shelter, is approximately 2 m wide and extends several meters into the back wall. The sediments observed within this cavity appeared to be undisturbed, but accessibility was limited due to its 30-cm-high entrance. The talus deposits begin just in front of the dripline and extend 10 to 12 m downslope. Apparently, the talus formed as a result of cultural occupations. Cultural materials were found to a depth of 50 cm within the rockshelter, to 90 cm in the talus, and to 50 cm at the base of the talus. No cultural materials were found in the small alcove.

Sediments and Stratigraphy

Within the rockshelter, the sediments observed in the profile of Test Unit 1 reflect a combination of Types 2 and 5 shelter fills as defined by Abbott (1994b). Type 2 fill is stratified, multicolored, internally derived silts and spalls; Type 5 refers to tufa deposits. The shelter fill in Test Unit 1 is 62 cm thick overlying weathered limestone bedrock (see Appendix B) and is divided into three zones (A-AC-C profile). The surficial A horizon is a 14-cm-thick, very dark grayish brown silty clay loam. The underlying AC horizon is a 37-cm-thick, very dark grayish brown clay loam, and the C horizon is an 11-cm-thick, brown silty clay loam. A charcoal sample collected from the AC horizon at 20–30 cm yielded a radiocarbon age of 710 ± 50 B.P. (see Appendix A).

On the talus, the profile of Test Unit 3 revealed three zones (A-C-C2 profile, see Appendix B). The A horizon is a 27-cm-thick, very dark grayish brown clay loam. The underlying C horizon is a 27-cm-thick, very dark gray silt, and the C2 horizon is a very dark gray clay loam that is 36 cm thick.

At the base of the talus, the profile of Test Unit 2 revealed a 51-cm-thick colluvial mantle overlying weathered limestone bedrock (see Appendix B). This suggests that some, if not all, of the cultural materials in the lower talus may have been redeposited from the upper talus. Four zones (OA-A-C-2Cr profile) were observed in the profile. The OA horizon is a 7-cm-thick mix of gravelly black silt and organic debris. The underlying A horizon is a 19-cm-thick, very dark

gray, very gravelly clay loam. The C horizon is a 25-cm-thick, dark grayish brown silty clay loam, while the 2Cr horizon consists of grayish brown silty clay that grades into weathered bedrock.

Cultural Materials

The large artifact assemblage recovered from this site consists of 11 arrow points, 3 dart points, 33 chipped stone tools, 3 cores, 2,101 pieces of unmodified debitage, 2 metate fragments, and 3 hammerstones (Table 11). Classification of projectile point types was possible for only 2 of the arrows and 2 of the darts. These four specimens were identified as one each Granbury, Bonham preform, Darl, and Marcos. Other cultural materials recovered include approximately 60 kg of burned rocks, 245 bones (many exhibiting spiral fractures and evidence of burning; see Appendix C), and 42 unmodified mussel shells. The majority of artifacts and cultural materials were recovered from the talus, although significant amounts also were found within the shelter. No artifacts were found in Test Unit 4.

Cultural Features

The rockshelter itself was designated Feature 1 by the previous investigators. The shelter, a natural feature subsequently altered through cultural activities, is discussed above.

Feature 2, the only cultural feature recognized during the current investigations, is interpreted as a talus midden. Based on the observed extent of the talus sediments, the feature appears to encompass a 16x8-m area directly in front of the shelter's mouth (see Figure 31). Within Test Unit 3, all seven levels from the surface to 70 cm contained high frequencies of cultural materials, although the highest frequencies were found in the upper 20 cm. Total recovery from the surface to 70 cm in Test Unit 3 included 1,692 pieces of debitage, 462 (59 kg) fragmented burned rocks, 28 mussel shells, and 30 lithic tools. The 190 bones from these levels include remains of deer (most abundant), rabbit, bobcat, and bison. A carbonized wood sample recovered from 40–50 cm yielded a radiocarbon age of 730 ± 70 years B.P. (see Appendix A). No patterning of the burned rocks or purposefully constructed internal features (i.e., hearths) were identified within the excavated midden levels. The base of the midden was defined at 70 cm by a sharp decline in recovery which corresponded with the C/C2 soil horizon change, although some cultural materials were recovered at 70–90 cm.

Discussion

Charcoal samples from deposits inside the rockshelter and in the talus midden yielded virtually the same date ranges, A.D. 1279–1303 and A.D. 1251–1303 (calibrated). These assays indicate that the shelter was occupied during the Late Prehistoric period and that the talus midden accumulated at the same time. The arrow points lend support to this interpretation, as do two of the three dart points. Since the Darl and the untypeable fragment were found in levels producing arrow points and the radiocarbon-dated charcoal samples, they are interpreted as being recycled by the Late Prehistoric inhabitants. Only the Marcos dart point, which was found in the lowest level (80–90 cm) of the talus is problematic. It may represent an ephemeral Late Archaic occupation in the lower levels, or it could represent a recycled projectile point.

Site 41BL827 contains a rockshelter (Feature 1) and its

Table 11. Artifacts recovered from 41BL827

Artifacts	Test Unit 1	Test Unit 2	Test Unit 3	Totals
Arrow points	7	0	4	11
Dart points	1	0	2	3
Perforator	0	0	1	1
Adze	0	0	1	1
Knives	0	0	2	2
Scrapers	3	2	6	11
Miscellaneous bifaces	2	0	3	5
Miscellaneous unifaces	4	1	8	13
Cores	0	3	0	3
Unmodified debitage	257	86	1,758	2,101
Ground stones	0	0	2	2
Battered stones	0	0	3	3
Totals	274	92	1,790	2,156

associated talus deposit (Feature 2). The shelter was occupied during the early part of the Late Prehistoric period; the talus deposits apparently accumulated as a result of periodic cleaning of cultural debris from within the shelter and contemporaneous cultural activities performed on the talus itself (e.g., knapping, food preparation). Although a significant portion of the shelter deposits and, to a lesser degree, sections of the talus have been vandalized, the current investigation results indicate that substantial portions of both areas contain intact cultural deposits.

RESULTS OF TESTING—CORYELL COUNTY SITES

Karl Kleinbach, Gemma Mehalchick, Douglas K. Boyd, and Karl W. Kibler

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41CV722

Site Setting

Site 41CV722 is situated in a narrow valley near the head of a spring-fed tributary approximately 1.25 km north of Cowhouse Creek. Bisected by the south-flowing tributary, the site encompasses the colluvial slopes and toeslopes of the valley wall (including an upper colluvium-covered bedrock bench or terrace) and the alluvial terrace along the tributary (Figure 32). An active spring surrounded by maidenhair ferns and beautyberry is located near the northern site boundary. Originating on the uplands east of the site, two shallow westerly flowing drainages feed into the tributary.

A historic occupation (site 41CV723) overlaps the west-central portion of prehistoric site 41CV722. Historic ceramics and glass fragments, in addition to wall or foundation remnants, were observed. The site elevation is 230–240 m above mean sea level.

Previous Work

Moore and Bradle (Texas A&M University) recorded the site on 17 January 1984. Sparse cultural materials consisting of burned rocks, mussel shells, and lithics were noted. The deposits were considered shallow, and an estimated 6 percent of the site had been impacted by clearing, vandalism, trails, and erosion.

On 10 March 1992, Oglesby and Doering (Mariah Associates) revisited and reevaluated the site based on archeological potential and geomorphic context. Two distinct surfaces suggested two periods of valley fill. The higher surface was 3 m above the channel and consisted primarily of colluvial sediments of unknown thickness which graded toward the valley axis. The degree of soil development was minimal, suggesting recent (i.e., late Holocene) deposition and/or active slope movement. The second surface was inset within the colluvium at 1–1.5 m above the channel. This fill consisted of fine-grained alluvium with large clast inclusions (i.e., reworked colluvium). Soil development also was weak, suggesting late Holocene deposition. A thin scatter of cultural materials was exposed on the colluvial slopes, particularly in vandalized areas, indicating a good potential for buried cultural deposits. Although no cultural materials were observed in the alluvial fills, these sediments also had the potential to contain intact archeological deposits. Based on these observations, shovel testing of both surfaces was recommended.

On 1 April 1992, 14 shovel tests were excavated. Six of the 10 tests located on the colluvial slopes and 3 of the 4 tests placed on the alluvial terrace were positive. Although recent materials were intermixed with prehistoric artifacts in the upper 10 cm, the results suggested that a cultural component was buried at 20–30 cm in the colluvial wedges and up to 50 cm deep in the alluvial terrace. These cultural deposits were of unknown significance and were recommended as being potentially eligible for NRHP listing. The recommended testing effort was a minimum of 2–3 backhoe trenches and 4–5 m^2 of manually excavated test pits (Trierweiler, ed. 1994:A1000–A1001).

Work Performed

Formal testing of 41CV722 was completed on 18 August 1995. The test excavations included

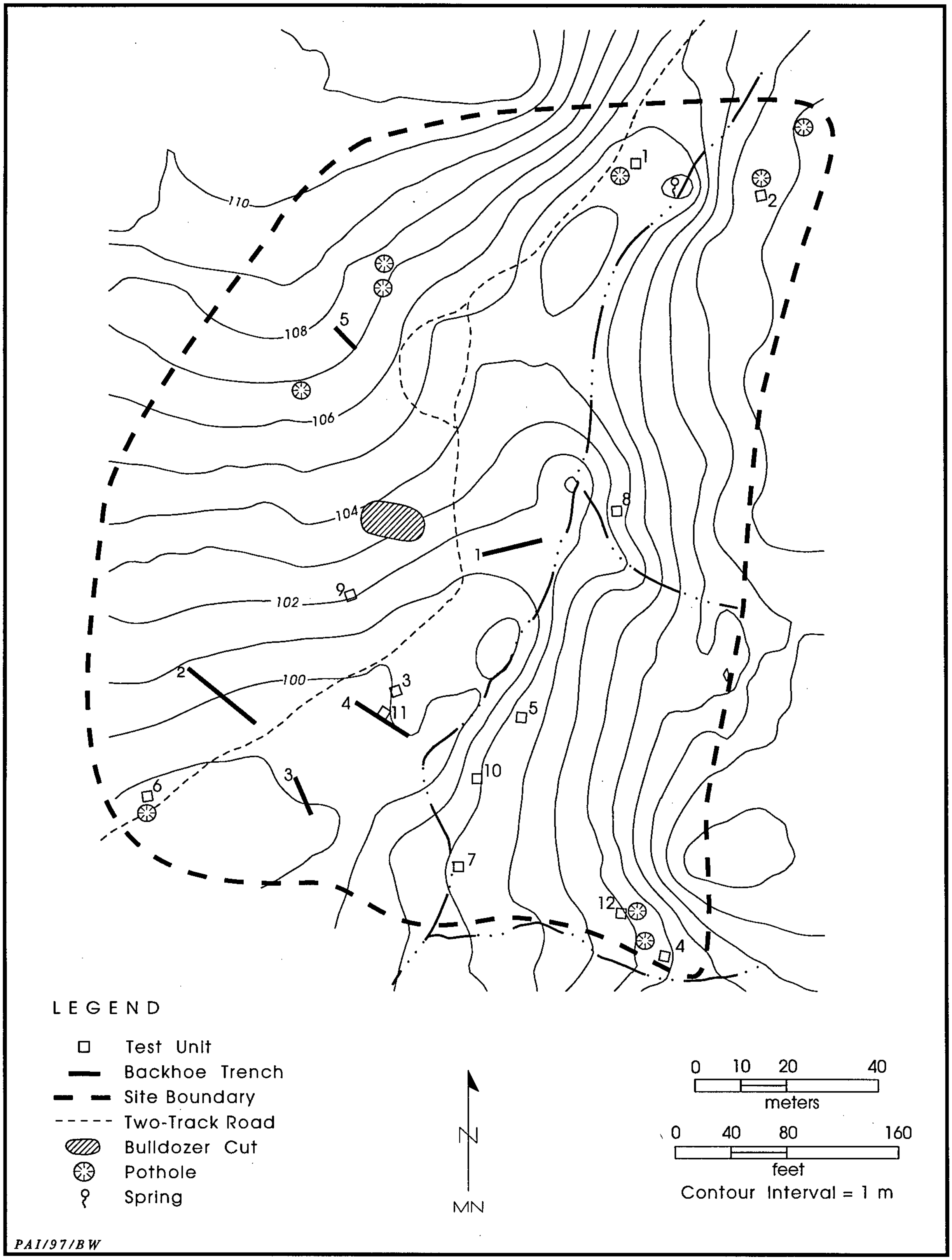

Figure 32. Site map of 41CV722.

five backhoe trenches (Backhoe Trenches 1–5), eleven 1x1-m test units (Test Units 1–11), and one 50x50-cm test unit (Test Unit 12) in four depositional settings: (1) the distal end of a colluvial deposit on the east side of the valley; (2) gravelly alluvium along the valley axis; (3) toeslopes of interdigitated alluvium and colluvium on the west side of the valley; and (4) colluvial deposits on the western midslopes of the valley. A total of 6.95 m^3 was manually excavated.

All of the trenches were located on the valley alluvium and the colluvial midslopes west of the tributary. Backhoe access east of the channel was impossible due to dense vegetation, the steep gradient of the colluvial slopes, and the lack of roads. Because backhoe-related impacts to the area would be too severe, trenching east of the tributary was not undertaken. To compensate for this, additional test units were excavated to provide areal coverage and adequate sampling. For ease of discussion, the excavations are described in the order of the depositional settings noted above.

Seven test units (Test Units 2, 4, 5, 7, 8, 10, and 12) were excavated along the distal end of the colluvial deposit on the east side of the valley. All were oriented relative to magnetic north. Test Unit 2 was placed in the northeastern portion of the site approximately 25 m east of the spring and near some potholes. It was excavated to abundant gravels at 50 cm. At the southeastern site boundary, additional potholes were observed just north of a westerly flowing side drainage. Five meters beyond the eastern extent of this vandalized area, Test Unit 4 was excavated to dense gravel at 60 cm. Test Unit 5 was placed 10 m east of the tributary and was excavated to decomposing bedrock at 60 cm. Test Unit 7, situated ca. 30 m south of Test Unit 5, was excavated to 20 cm, where a strongly rubified clay loam containing numerous gravels was encountered. Excavated to abundant gravels at 40 cm, Test Unit 8 was placed just east of the tributary and north of a westerly flowing side drainage located near the site's center. About 10 m east of the tributary and equidistant between Test Units 5 and 7, Test Unit 10 was excavated to numerous pebble-sized gravels at 90 cm. Ten meters northwest of Test Unit 4, Test Unit 12 (oriented to 15°) was excavated within the aforementioned vandalized area, contiguous with the western edge of a pothole. Abundant gravels halted excavations at 60 cm.

Backhoe Trenches 1, 3, and 4, the eastern end of Backhoe Trench 2, and Test Units 3 and 11 were excavated in the valley alluvium along the west of the drainage. Backhoe Trench 1 (measuring 10x0.8x1.3 m and oriented to 80°) was located in the north-central portion of the alluvial deposit 10 m west of the tributary. Placed 30 m from the drainage and southwest of Backhoe Trench 1, the location of Backhoe Trench 2 was specifically selected to cross section the contact between the valley alluvium and the colluvial slope. It was oriented to 306° and had dimensions of 18x0.80x0.80 m. Backhoe Trenches 1 and 2 contained a few scattered burned rocks. Backhoe Trench 3 (oriented to 160° and measuring 7x0.8x1.5 m), located southwest of Backhoe Trench 1, was excavated in the valley alluvium; no cultural materials were observed. Oriented to 130°, Backhoe Trench 4 (11x0.8x0.8 m) was placed southwest of Backhoe Trench 1, between Backhoe Trenches 1 and 3. This trench bisected a small rise on which a linear concentration of burned rocks was exposed. The upper 15–20 cm of the trench profile revealed a burning episode containing ash, charcoal, burned rocks, and pieces of metal. This may have resulted from a push pile that was subsequently incinerated, or it may represent a portion of the historic component (site 41CV723) that burned in place. A sharp contact between the burn and a lower deposit was visible in the north wall profile of Backhoe Trench 4, while an intact burned rock feature was exposed in the lower undisturbed fill. Test Unit 3, oriented to 324°, was located 10 m north of Backhoe Trench 4. A dense gravel deposit halted the excavation at 60 cm. Test Unit 11 was placed along Backhoe Trench 4 to investigate the feature. Excavation terminated at a dense gravel deposit encountered across the unit at 40–60 cm.

The western end of Backhoe Trench 2 and Test Units 1, 6, and 9 were excavated on the valley's western toeslope which consists of interdigitated alluvial and colluvial deposits. At the north-central site margin, Test Unit 1 was placed east of a dirt road west of the spring and was excavated to abundant gravels at 70 cm. A large (3x3x0.3 m) pothole was observed 3.2 m south-southwest of this test unit. Near the southwestern site margin, Test Unit 6 was oriented to magnetic north and was excavated just north of a shallow pothole. This unit appears to crosscut two analysis units (see Analysis Units 1 and 2

below) based on the presence of two buried A horizons and corresponding radiocarbon dates. Excavation ceased at 120 cm due to the presence of large gravels. Test Unit 9, located southeast of Backhoe Trench 5 and just south of a bulldozer cut, was oriented to magnetic north and was excavated to bedrock at 60 cm.

Backhoe Trench 5 and the western end of Backhoe Trench 2 were on the colluvial slope west of the tributary. Backhoe Trench 5 (oriented to 290° and measuring 6x0.8x0.9 m) was placed near the northwest site margin in the vicinity of several shallow potholes or foxholes. As stated above, Backhoe Trench 2 straddled the boundary between the colluvial slope and the alluvial terrace. Both trenches exhibited poorly sorted, gravelly clay loam with a weakly developed soil (A-C) profile; both were devoid of cultural materials. No manual excavations were conducted in this area.

Definition of Analysis Units

Although the eastern and western site boundaries are delimited by topography (i.e., the colluvial slopes), the landforms parallel the tributary for hundreds of meters to the north and south. Based on testing results, subsurface cultural materials are present within an area measuring approximately 170 m north-south by 125 m east-west adjacent to and downstream from a small spring. Within this area, the vertical extent and contextual integrity of the cultural deposits vary considerably depending largely upon geomorphic setting. Each of the four geomorphic settings described above is identified as an analytical unit; the sequence of analysis units follows the same order in which they were previously mentioned. Analysis Units 1, 2, 3, and 4 correspond to the upper colluvial slope and terrace east of the drainage, the lower alluvial terrace adjacent to the drainage on the west, and the colluvial toeslopes and colluvial midslopes west of the drainage, respectively (Figure 33).

Analysis Unit 1

Located on the east side of the tributary, Analysis Unit 1 consists of the distal end of a colluvial mantle that covers the eastern valley wall and sits about 3 m above the channel. The surface of this deposit covers approximately 9,000 m^2, with an average width of 35 to 40 m. This analysis unit parallels the entire length of the tributary and is bisected by shallow side drainages. Because of its moderate slope and dense vegetation, the cutbanks afford little visibility. An open oak and juniper woodland is present, but surface visibility is generally obscured by a dense cover of greenbrier, vines, grasses, poison ivy, and leaf litter. Several potholes, each about 30 cm in diameter and 30 cm deep, are present at the southeastern margin of this setting. Burned rocks, debitage, *Rabdotus* snails, and mussel shells have been exposed by this disturbance.

Extent and Depth

Five of the seven test units (Test Units 2, 4, 5, 10, and 12) produced cultural materials; however, only Test Units 5, 10, and 12 appear to contain isolable cultural deposits. Test Units 5 and 10, about 15 m apart north to south, exhibit peaks in cultural materials at 10–30 cm. In Test Unit 10, this increase is coincident with Feature 2 (a burned rock concentration) at 21–32 cm. Approximately 45 m southeast of Test Unit 10, Test Unit 12 contained Feature 4, a midden deposit, at 0–35 cm. The excavation results indicate that a cultural occupation, buried in the upper 30–35 cm, has a horizontal extent of 60 m northwest-southeast and 40 m northeast-southwest.

Sediments and Stratigraphy

All seven test unit profiles depict the distal end of an upward-fining colluvial deposit. The upward-fining deposit suggests that the gradient of the eastern colluvial slope has decreased over time, such that only fine-grained sediments are currently deposited at the terminus. The stratigraphic profiles of three of the seven test units are described in greater detail in Appendix B.

Test Units 5, 7, 8, and 10 revealed similar profiles consisting of dark to very dark grayish brown clay loam A horizons (15–33 cm thick) and gravelly brown rubified clay loam Bw horizons (5–55 cm thick) overlying poorly sorted gravels or limestone bedrock. A late Holocene age is attributed to this colluvial deposit based on the degree of soil development and a conventional radiocarbon age of 580 ± 60 B.P. from feature-associated charcoal from Test Unit 12 (see below).

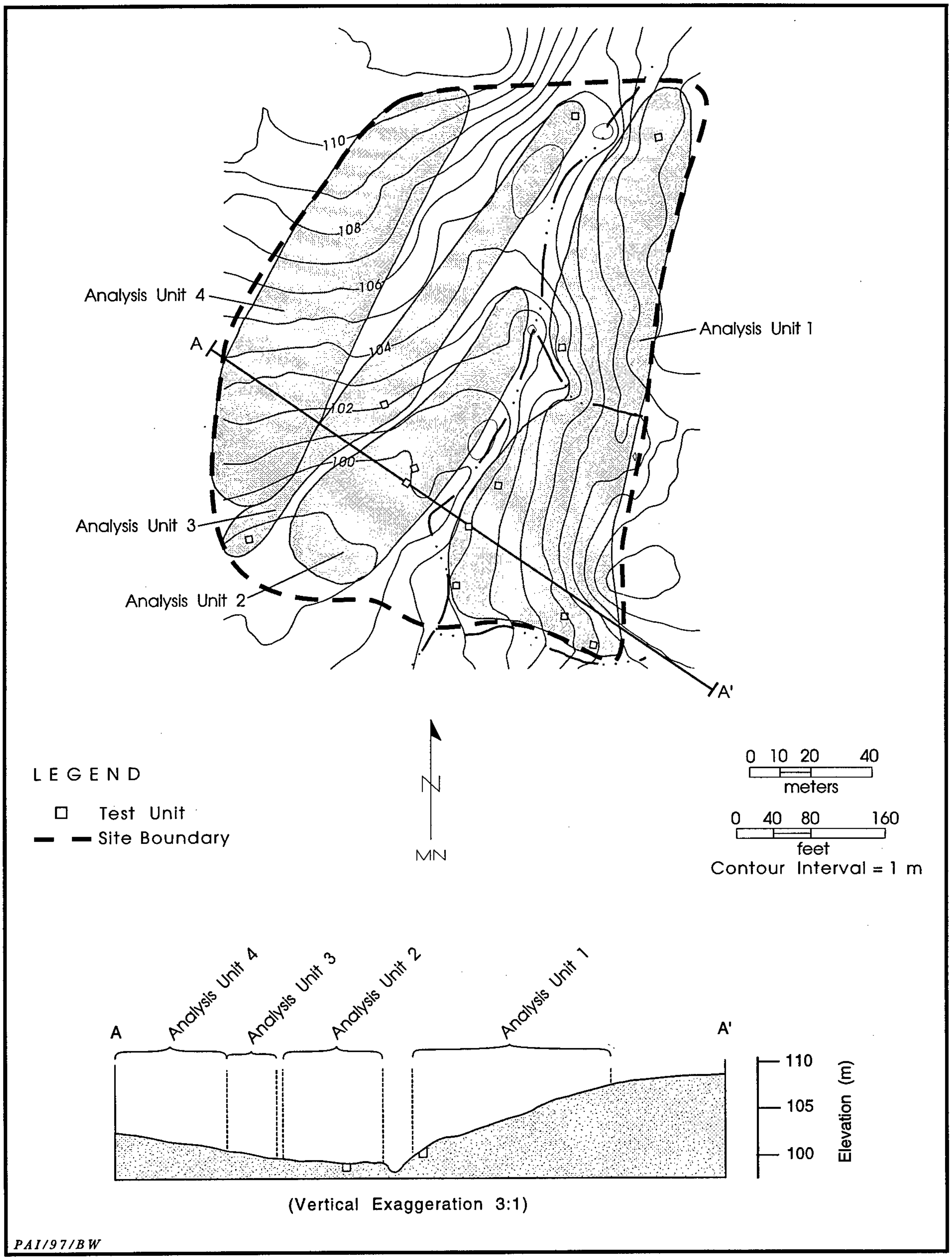

Figure 33. Map of analysis units and schematic east-west valley profile, 41CV722.

Cultural Materials

Artifacts were recovered from five of the seven test units, with Test Units 7 and 8 yielding no cultural materials (Table 12). Test Units 2 and 4 produced sparse amounts of burned rocks and lithic artifacts, including a Darl point in Test Unit 2. A total of five burned rocks (0.5 kg) and 56 of the 61 lithic artifacts recovered were buried at 10–30 cm in Test Unit 5. Diagnostic materials from this deposit include one untyped arrow point and one arrow blank. In addition, an untyped dart point was recovered at 40–50 cm. In Test Unit 10, a peak in cultural materials at 10–30 cm is associated with Feature 2 (see Cultural Features). An additional seven excavated levels produced a total of four burned rocks (0.25 kg), 19 flakes, and 1 unmodified mussel shell valve. The 35-cm-thick burned rock midden deposit in Test Unit 12 produced abundant cultural materials (see Cultural Features). A significant decrease in cultural materials and a concurrent increase in gravels occurs below the midden at 35–60 cm. The cultural remains from these lower levels include three burned rocks, one unmodified mussel shell, one bone, six flakes, and an untyped dart point.

Cultural Features

Feature 2, a burned rock concentration in Test Unit 10, was encountered at 21–32 cm. The feature consisted of a single layer of 46 medium-sized angular burned rocks (10 kg) and 2 unburned rocks (0.5 kg). All of the rocks were laid horizontally and exhibited no imbrication. The feature extended across the eastern half of the test unit; however, almost half of the burned rocks were confined to the southeast quadrant. Overall, Feature 2 gradually dipped from east to west, with no additional cultural materials found in the feature matrix. Disturbances included a large root along the north wall, with many small roots throughout. Cultural materials in the matrix surrounding and possibly associated with Feature 2 consisted of 28 small burned rocks (2.25 kg), a graver, and 64 pieces of debitage.

A midden deposit (Feature 4) was present from the surface to 35 cm in Test Unit 12. Cultural materials from the feature included 43 fist-sized and smaller angular burned rocks (3 kg), 169 pieces of debitage, 22 bones (3 identified as deer/antelope), 4 unidentified mussel shell valves, and 5 stone tools including an arrow blank. Approximately 87 percent of the Feature 4 assemblage consists of lithic artifacts and burned rocks. A charcoal sample collected at 20–30 cm yielded a radiocarbon age of 580 ± 60 B.P. (see Appendix A). Based on the results of the 50x50-cm excavation unit, vandal exposures, and natural topography, the minimum estimated dimensions of Feature 4 are 8 m northwest-southeast by 4 m northeast-southwest.

Discussion

Test Units 4, 5, and 12 reveal the presence of a discrete occupation zone buried within the A horizon of the colluvial deposit. The upward-fining colluvial deposit encapsulating the cultural materials and features suggests that the artifacts within the clayey epipedon (A horizon) are in primary context. A calibrated charcoal

Table 12. Artifacts recovered from Analysis Unit 1, 41CV722

Artifacts	Test Unit 2	Test Unit 4	Test Unit 5	Test Unit 10	Test Unit 12*	Totals
Arrow points	0	0	2	0	1	3
Dart points	1	0	1	0	1	3
Scrapers	0	0	2	0	2	4
Graver	0	0	0	1	0	1
Miscellaneous biface	0	0	1	0	0	1
Miscellaneous uniface	0	0	0	0	1	1
Core	0	0	0	0	1	1
Unmodified debitage	3	1	55	83	175	317
Totals	4	1	61	84	181	331

*Test Unit 12 measured 50x50 cm.

date of A.D. 1307–1421 for Feature 4, in addition to diagnostic artifacts from this cultural zone (consisting solely of arrow points), indicates Late Prehistoric period occupations.

Analysis Unit 2

Analysis Unit 2 subsumes the valley alluvium west of and adjacent to the tributary. Covering about 1300 m², this deposit ranges from 15 to 30 m wide, is at least 120 m long, and is not more than 1 m above the present-day channel. Vegetation consists of an oak-juniper-pecan woodland with a thick understory growth of greenbrier, grasses, vines, and poison ivy. Surface visibility is poor and is limited to a dirt road that parallels the tributary. Burned rocks are exposed in the road and on a small rise adjacent to (east of) the road.

Extent and Depth

The four backhoe trenches and two test units on the alluvial terrace demonstrate the presence of a discrete cultural deposit. Within an area measuring 11 m north-south by 6 m east-west, Test Units 3 and 11 reveal an occupation zone represented by two burned rock features and associated cultural materials. Based on the minimum and maximum depths of the features, the top of the 20-cm-thick occupation level is buried in the alluvium at depths between 15 and 37 cm. In addition, the lower 40 cm of deposits (i.e., 80–120 cm) in Test Unit 6 appear to represent a continuation of the alluvial sediments observed in Test Units 3 and 11, thereby enlarging the northeast-southwest dimension of the buried cultural zone to at least 40 m. The upper 80 cm of deposits in Test Unit 6, which are not included in Analysis Unit 2, represent a drape of colluvium over the distal edge of the alluvial terrace.

Based on the degree of soil development and radiocarbon assays from feature-associated charcoal (see below), the overlying fine-grained alluvium is later Holocene in age and probably began accumulating no earlier than 2,000 to 2,500 years ago. How this alluvial unit correlates with the alluvial chronology defined by Nordt (1992) for the larger stream valleys at Fort Hood is unclear at this time. The age, origin, and thickness of the underlying gravelly deposits are also unclear or unknown. The many filaments and thin clast coatings of carbonate suggest a period of deposition no earlier than the beginning of the late Holocene. The poorly sorted gravels are indicative of colluvial transport; however, it is possible that the gravelly deposits are bedload alluvium that was not sorted due to the peripheral position of the drainage in the basin.

In Test Unit 6, the sediments at ca. 75–120 cm reveal a 3Ab-3C profile. The relatively fine texture of the soil suggests that cultural materials are in primary context and that the soil represents a stable surface. Charcoal collected from the buried paleosol yielded a radiocarbon age of 1570 ± 60 B.P. The entire stratigraphic profile is discussed in greater detail under Analysis Unit 3.

Cultural Materials

A total of 203 artifacts was recovered from Analysis Unit 2 (Table 13). The majority of the cultural materials in Test Unit 3, which was excavated to 60 cm, were discovered in the hearth matrix (Feature 1) at 15–35 cm (see Cultural Features). The nonfeature sediments yielded a total of 17 bones, 26 burned rocks (8 kg), 2 pieces of debitage, and an unmodified mussel shell valve.

Test Unit 6 contained cultural materials at 80–120 cm, with 108 of 133 items (81.2 percent) discovered at 90–110 cm. This depth corresponds

Table 13. Artifacts recovered from Analysis Unit 2, 41CV722

Artifacts	Test Unit 3	Test Unit 6*	Test Unit 11	Totals
Arrow point	0	0	1	1
Dart points	0	1	2	3
Scrapers	1	2	3	6
Choppers	0	1	1	2
Miscellaneous bifaces	0	1	1	2
Cores	1	0	1	2
Unmodified debitage	28	100	59	187
Totals	30	105	68	203

*80–120 cm only

to the 3Ab horizon and its contact with the underlying 3C horizon. The assemblage consists primarily of burned rocks (12 percent) and lithic artifacts (84.2 percent), including an Ellis point.

In Test Unit 11, abundant cultural materials were associated with Feature 3 (a burned rock concentration) at 37–59 cm (see Cultural Features). Ten burned rocks (0.75 kg) and two flakes were found in the upper 20 cm, which was disturbed by historic/modern burning. At 20–30 cm, the undisturbed matrix below this zone yielded seven pieces of debitage, one scraper, and one Bonham point.

Cultural Features

Encountered at 15–35 cm, Feature 1 extended across Test Unit 3 and was visible in all four wall profiles. This burned rock concentration or hearth consisted of two to three layers of horizontally laid rocks ranging in size from 3x2x2 cm to 20x15x5 cm. Approximately 90 percent of the 213 burned rocks (57 kg) are angular. The base of the hearth rested on a gravel deposit; 41 unburned rocks (43 kg) were present at 35–40 cm, with abundant gravels noted in the following two levels. Although situated in an area with readily available rocks (i.e., the gravel deposit), the integrity of the feature may be compromised by its location within a moderate to high energy depositional environment. One scraper, 1 core, 26 pieces of debitage, and 1 unmodified mussel shell valve were found in the feature matrix. Submitted for macrobotanical analysis, a flotation sample produced no identifiable charred plant remains (see Appendix D). Charcoal obtained from Feature 1 at 39–40 cm yielded a radiocarbon age of 1680 ± 100 B.P. (see Appendix A).

Encountered in the northwestern quadrant of Test Unit 11 at 37 cm, Feature 3 gradually sloped southeast to a maximum depth of 59 cm. The burned rock concentration consisted of one to two layers of 125 burned rocks (35 kg), most horizontally laid on a gravel deposit (Feature 34). As with Feature 1, Feature 3 may have been subjected to some degree of disturbance due to stream flooding. Approximately 60 percent of the burned rocks are fist-sized, rounded cobbles, with the remainder being medium sized and angular. Maximum excavated dimensions were 90 cm east-west by 100 cm north-south. Based on the excavation results and the exposures afforded by Backhoe Trench 4 and Test Unit 11, Feature 3 appears to be an ovate concentration of burned rocks with maximum dimensions of 275 cm east-west by 200 cm north-south. Cultural materials found in the

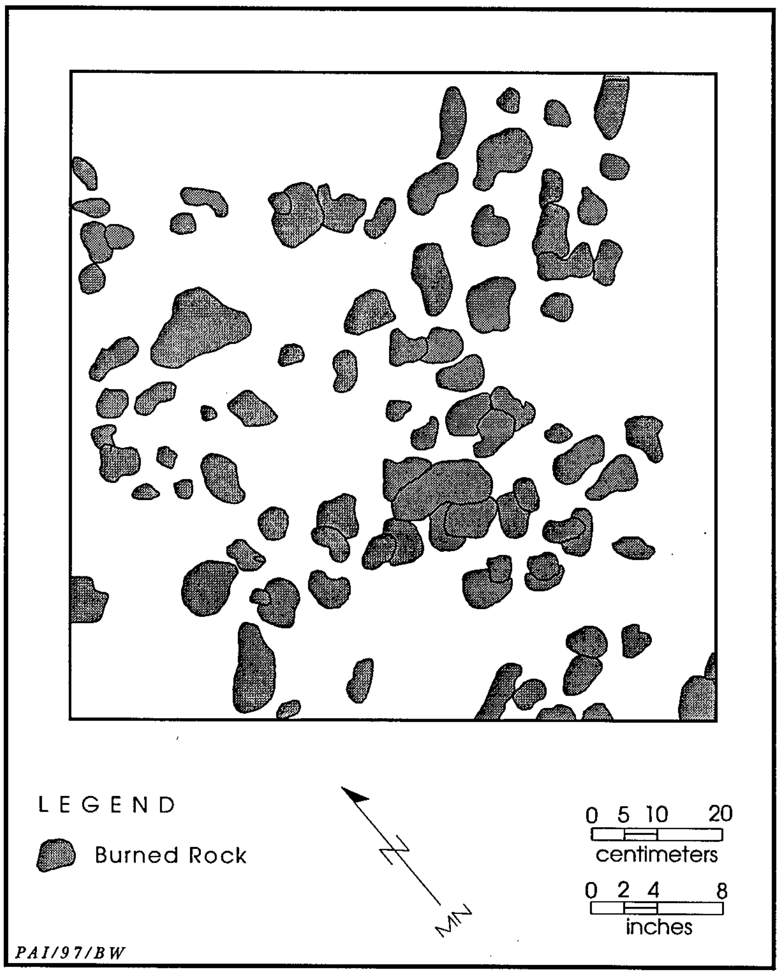

Figure 34. Plan view of excavated portion of Feature 3 in Test Unit 11, 41CV722.

feature fill consist of 15 pieces of debitage and 4 bones. The matrix surrounding the hearth contained 35 flakes, 1 unmodified mussel shell valve, 2 bones, and 7 stone tools including 1 Darl point and 1 Ensor point. Although not submitted for macrobotanical analysis, a processed flotation sample contained low frequencies of microdebitage, charred wood, and small fragments of bone. Charcoal collected at 48 cm yielded a radiocarbon age of 1460 ± 60 B.P (see Appendix A).

Discussion

Two burned rock features and corresponding peaks in cultural materials are buried in alluvial sediments overlying poorly sorted gravels in Test Units 3 and 11. Abundant cultural materials at 90–110 cm in Test Unit 6 are buried in a similar depositional setting. These remains are indicative of a stratigraphically discrete cultural component which dates to the latter part of the Late Archaic period. This is substantiated by calibrated dates of A.D. 248–532 for Feature 1, A.D. 423–592 at the base of the 3Ab horizon in Test Unit 6, and A.D. 552–654 for Feature 3 (see Appendix A). An Ellis point recovered from the buried paleosol, in addition to Darl and Ensor points associated with Feature 3, support this chronometric assessment.

Analysis Unit 3

Analysis Unit 3 consists of the toeslopes located west of the tributary that extend the entire length of the site from north to south and are generally less than 10 to 20 m wide. Although the vegetation across this area ranges from dense canopy with thick understory growth to completely open, surface visibility is poor due to leaf litter and grass cover. A few shallow potholes were noted at the northern and southern extent of this setting, but no cultural materials were observed around these areas.

Extent and Depth

Abundant cultural remains at 20–40 cm in Test Unit 1 suggest the presence of a buried cultural occupation. Cultural materials were recovered from all eight levels in Test Unit 6, except Level 5 (40–50 cm). Excavated to 60 cm, no discrete occupations were apparent in Test Unit 9. Based on the foregoing, one intact cultural lens appears to be shallowly buried (ca. 10–40 cm) in the vicinity of Test Unit 1.

Sediments and Stratigraphy

The stratigraphic profiles of Test Units 1, 6, and 9 represent colluvial and alluvial deposition at the toeslope of the western valley wall. Colluvial sedimentation has been in the recent past, and is currently, the predominant mode of deposition as revealed in the upper profiles of the test units. The profiles of Test Units 1 and 6 are described in detail in Appendix B.

The profile of Test Unit 1 consists of 57 cm of interdigitated colluvial and alluvial sediments overlying a poorly sorted gravelly clay loam. A weak cumulic soil has formed on these sediments, consisting of a 24-cm-thick, very dark gray clay A horizon and a 33-cm-thick, black clay AC horizon. Temporally diagnostic artifacts recovered from both soil horizons indicate that the sediments were deposited within the last ca. 700–800 years. The fine-grained sediments and few matrix-supported gravels suggest that these cultural materials are in primary context.

The 120-cm-thick profile of Test Unit 6 (Figure 35) reveals two buried soils formed in interdigitated colluvial and alluvial sediments (A-C-2Ab-2Bwb-2C-3Ab-3C profile). Each soil developed in an upward-fining, gravelly clay loam deposit, representing a decrease in slope gradient and colluvial transport of finer materials and/or periodic increases in fine-grained alluvial deposition at the toe of the slope. This resulted in episodes of surface stability and soil formation, with the resultant soils having the greatest potential for yielding intact cultural materials. Charcoal collected for the two buried soils (2Ab-2Bwb and 3Ab horizons) yielded conventional radiocarbon ages of 320 ± 70 B.P. and 1570 ± 60 B.P., respectively. The dates and their provenience indicate that a greater degree of stratigraphic separation of cultural occupations is potentially present along the western toeslopes than in the valley alluvium in the central portion of the site due to multiple agents of deposition. A 5–10-cm-thick, gravelly colluvial wedge within the 3Ab horizon which pinches out to the south provides separation of late Archaic occupations and separates earlier occupations from later ones.

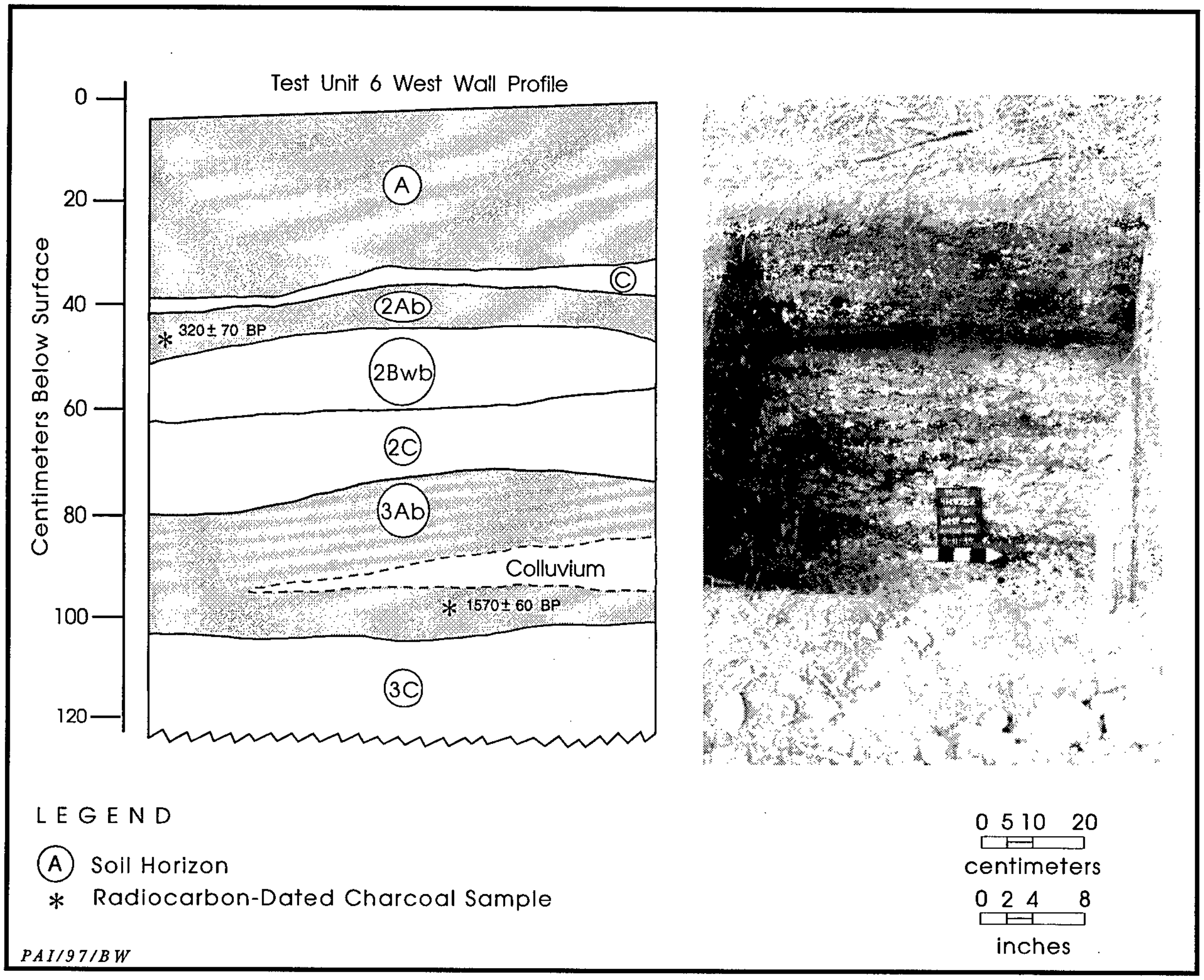

Figure 35. Photograph and profile of west wall of Test Unit 6, 41CV722.

Cultural Materials

Cultural materials from Test Unit 1 consist of 5 unmodified mussel shell valves, 27 burned rocks (2.5 kg), 57 burned and unburned bones, and 34 lithics from the surface to a maximum depth of 60 cm. Of the entire assemblage, 95 of 124 prehistoric items (76.6 percent), including 1 Clifton preform, were found at 20–40 cm. Recovered at 10–20 cm, additional temporal diagnostics consist of two arrow point blanks and one Bonham point.

The upper 80 cm in Test Unit 6 produced 29 flakes, a scraper, 4 bones, 2 unmodified mussel valves, and 26 small burned rocks (1 kg). No cultural materials were recovered from the buried paleosol (2Ab horizon) at 40–50 cm. Table 14 lists the materials recovered from Analysis Unit 3.

Discussion

Although not associated with cultural materials, charcoal collected from a buried A horizon at ca. 40–50 cm in Test Unit 6 yielded a calibrated date of A.D. 1477–1657. Because this date is sandwiched between cultural zones, it indicates that this portion of the site was occupied prior to and after this time. Coupled with the diagnostic artifacts recovered from a discrete cultural zone in Test Unit 1, this evidence indicates substantial occupations in the Analysis Unit 3 area during the Late Prehistoric period.

This setting has the potential to preserve stratigraphically separable occupations dating to the Late Prehistoric period (i.e., Austin and Toyah phases). The depositional environments along the toeslope of the western valley wall are

Table 14. Artifacts recovered from Analysis Unit 3, 41CV722

Artifacts	Test Unit 1	Test Unit 6*	Test Unit 9	Totals
Arrow points	4	0	0	4
Knife	1	0	0	1
Scrapers	2	1	0	3
Chopper	1	0	0	1
Miscellaneous bifaces	3	0	0	3
Unmodified debitage	23	29	15	67
Totals	34	30	15	79

*0–80 cm only

a complex mixture of colluvial and alluvial sediments and soil imprints which are currently not clearly understood. The delineation of the various depositional processes and their resultant facies is worthy of investigation, not only for understanding the archeological record but for potential paleoenvironmental and landscape development data.

Analysis Unit 4

Analysis Unit 4 encompasses the midslope colluvial deposits west of the tributary. Stretching the entire length of the site, the slopes are 25–35 m wide and have steep to moderate gradients. Disturbances observed on the midslope west of the tributary include clear-cutting, bulldozing, and vandalism. The entire area has experienced erosion, particularly the upper portion of the slopes where exposed bedrock outcrops are visible. Vegetation consists of a juniper, oak, and hackberry woodland, with grasses and leaf litter obscuring the surface. The only excavations sampling these deposits were Backhoe Trench 5 and the western end of Backhoe Trench 2. No cultural remains were observed in either trench, and the poorly sorted gravelly clay loam, with little or no soil development, indicates that the deposit is entirely colluvial. Even if cultural remains were encountered in this setting, they would be in a redeposited context.

Summary and Conclusions

Based on the excavation results, multiple components are buried within different geomorphic settings at 41CV722. The absolute and relative chronological data suggest that the tributary valley was occupied from the Late Archaic through Late Prehistoric periods. Utilization of the valley floor (Analysis Unit 2), primarily during the Late Archaic period but also into Late Prehistoric times, is established by the dates from Features 1 and 3 and diagnostic lithic artifacts recovered from Test Units 6 and 11. Late Archaic and Late Prehistoric occupations were identified on the eastern valley upper terrace/colluvial slope (Analysis Unit 1), as evidenced by 20-cm-thick cultural deposits yielding abundant artifacts, including both arrow and dart points, buried in late Holocene alluvium. In addition, Late Prehistoric occupational evidence is present in the colluvial toeslope deposits west of the drainage (Analysis Unit 3). A discrete buried occupational layer in Test Unit 1 produced four arrow points; a radiocarbon date of corresponding age was obtained from a buried A horizon in Test Unit 6. No cultural evidence was found in the colluvial sediments of the valley midslope west of the drainage (defined as Analytical Unit 4).

The artifact assemblages from the three occupational areas demonstrate that lithic procurement/reduction, hunting (primarily of deer), and exploitation of aquatic foods were primary activities. The invertebrate remains are of particular significance since this site is at least 2 km from the nearest known perennial drainage suitable for mollusk habitat (Cowhouse Creek). The distinct occupational zones, intact hearth, and datable organic remains demonstrate that 41CV722 has the potential to yield valuable data concerning occupation of low-order tributary valleys.

41CV944

Site Setting

Site 41CV944 subsumes an upland (Manning) surface, its colluvial backslopes, and five associated rockshelters (Figure 36). The eastern third of the site consists of the denuded upland surface, which has experienced ubiquitous sheet erosion. An open oak-juniper-scrub oak woodland is present; however, a dense grass cover

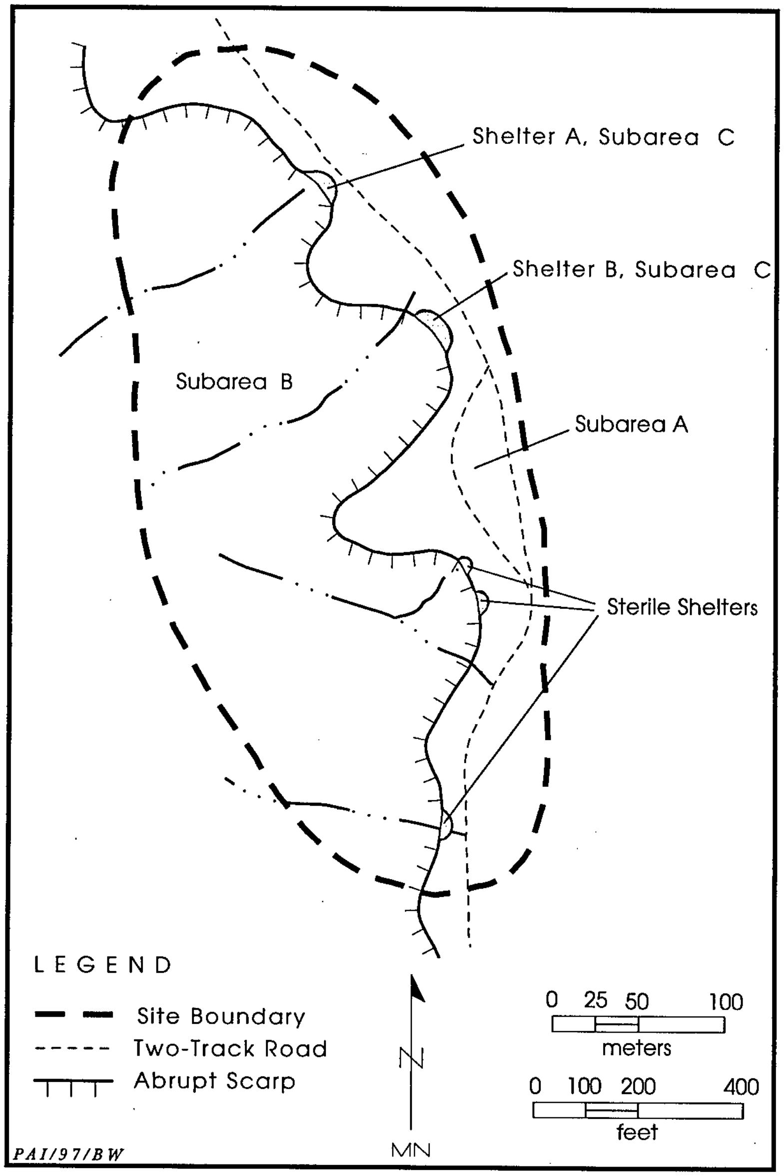

Figure 36. Site map of 41CV944 (Modified from Trierweiler, ed. 1994:A1100).

severely limits surface visibility. Comprising the western two-thirds of the site are the steep to almost vertical escarpments along the edges of the Manning surface. These slopes are covered with a dense oak-juniper forest and dense understory virtually obscuring the surface. Three of the five rockshelters are located in the southern half of the site and are completely devoid of sediments. The two shelters that contain deposits are situated a few meters below the escarpment rim near the heads of drainages that originate on the upland. Site elevation is 320–340 m above mean sea level.

Previous Work

On 19 April 1985, Dureka, Mesrobian, Michaels, Strychalski, Drollinger, and Masson (Texas A&M University) recorded the site as a lithic procurement/reduction area with an associated rockshelter complex. Debitage, hammerstones, scrapers, burned rocks, and bifaces were observed, and a burned rock mound was noted on the upland. One Wells, one Pedernales, and two untyped dart points were collected from the surface. Debitage, charcoal, bone fragments, and probable hearths were observed within the shelters. It was estimated that 63 percent of the site had been impacted by vehicular traffic, vandalism, and roof fall. Several sterile rock overhangs were noted within the site's boundary.

On 12 May 1993, Kleinbach and Abbott (Mariah Associates) revisited and reevaluated the site. Based on its archeological potential and geomorphic context, the site was divided into Subareas A–C. The site also was evaluated for its potential utility to address questions of lithic resource procurement and reduction. Chert outcrops and impact zones were identified, mapped, and described, and samples of unmodified chert were collected. Because the site contained chert resources and was not completely damaged, a crew conducted a lithic source area resurvey on 29 June 1993.

Subarea A includes a large expanse of the upland (Manning) surface, measuring 550 m north-south by 100 m east-west. The surface is mantled with a discontinuous residual soil primarily consisting of a black to very dark reddish brown, stony A horizon directly lying on a

thin, reddish brown Bt horizon. Total soil thickness is approximately 10–20 cm, but in various places it has been truncated by sheet erosion and is much thinner. A lithic resource procurement area containing a low density of debitage at the escarpment edge and along a trail at the eastern edge of the site was identified on the upland. Feature 1, a highly disturbed burned rock concentration measuring 5 m in diameter, was observed in the above-mentioned trail. Since Subarea A was stable to erosional throughout the Holocene and has no potential for intact deposits, shovel testing was not warranted. However, moderate amounts of residual chert were noted on and in the soil, leading to the designation of the upland as Chert Zone 1. In addition, Subarea A was defined as Impact Zone 1 and warranted resurvey since it was not completely disturbed. Based on the resurvey results (i.e., low artifact ubiquity), Chert Zone 1 was considered to have a limited potential to contribute to lithic procurement research.

Subarea B consists of the slopes of the Manning surface. The gradient is quite steep, with an average dip of 40° and some segments as steep as 70°. Observed disturbances were primarily due to sheet erosion and colluviation, supplemented by bioturbation. Four drainages had carved shallow notches into the upland margin, with rockshelters situated at the head of each drainage. Because all of these shelters, including the one designated as Shelter C by previous investigators, lacked internal deposits, they were included under Subarea B. Since all of Subarea B had very little to no potential to contain buried cultural components, shovel testing was not recommended. Subarea B did coincide with Chert Zone 2, but the slopes were excluded from resurvey due to their steep angle and extremely poor exposure.

Subarea C consists of two medium-sized rockshelters designated Shelters A and B by the previous investigators. Both shelters were filled with up to 50 cm of yellowish silt loam derived from weathering of the limestone walls. Shelter A measured 30x7 m and had a roof 1.5 to 4 m high. Embedded chert nodules were noted along the face of the overhang. The shelter appeared to have been occupied historically and contained a good deal of trash including a fair quantity of lumber, wooden crates and pallets, and a discarded refrigerator. Flakes, burned rocks, cores, a heat-altered biface fragment, and a few bone fragments had been exposed by vandalism. Two 50x50-cm test units placed in the eastern half of Shelter A encountered bedrock at 20 and 38 cm. Artifacts were found in all but one level, with the greatest frequencies noted at 0–10 cm.

Shelter B consists of three distinct overhangs along a 50-m stretch of the escarpment. The shelter had a maximum depth of 10 m and a roof height of up to 2.5 m. In places, drip erosion of the sediment revealed burned rocks, flakes, and bones. One 50x50-cm test unit contained cultural materials from the surface to 60 cm, with bedrock encountered at 70 cm. Numerous artifacts were recovered at 0–10 cm, and frequencies decreased with depth. In Subarea C, the results of the test excavations and the lack of appreciable vandalism in Shelters A and B indicated that both had an excellent potential to contain stratified cultural deposits.

Based on the resurvey and testing results, the site was divided into three management units. Shelters A and B, being geographically separate, were designated as Management Units 1 and 2, respectively. Since Shelters A and B had the potential to contain intact cultural components of unknown significance, formal testing of both was recommended. The minimum testing effort included 2–4 m^2 of manually excavated test pits to assess NRHP eligibility (Trierweiler, ed. 1994:A1099–A1104). The remainder of the site was designated as Management Unit 3, which required no further work; it had negligible potential to contain archeological materials in good context.

Work Performed

Formal testing of the two rockshelters comprising Subarea C was completed on 30 August 1995. The test excavations included three 1x1-m units (Test Units 1–3) in Shelter A and two 1x1-m units (Test Units 4–5) and one 50x50-cm unit (Test Unit 6) in Shelter B. A total of 2.15 m^3 was manually excavated.

Test Unit 1 was placed at the eastern margin of Shelter A, near the back wall and 1 m east of a pothole. The unit was oriented to 356° and was excavated to bedrock at 40 cm. Centrally located in the shelter, Test Unit 2 was excavated 50 cm south of the back wall and was oriented to magnetic north. Sloping from west to east, bedrock was encountered at 22–30 cm across the unit. The trash noted by the previous investiga-

tors at the shelter's western margin was still present. This debris was moved so that Test Unit 3 could be excavated in this area. The test unit was placed 60–70 cm south and east of the back wall on a level surface that was slightly higher than the surrounding area. Oriented to magnetic north, excavation ended at 20 cm with bedrock encountered across the entire unit.

Only two of the three overhangs comprising Shelter B contain appreciable deposits. Being geographically separate, these were designated the eastern and western overhangs. Test Units 4 and 6 were excavated in the eastern overhang. Oriented to magnetic north, Test Unit 4 was placed 1 m south of the back wall at the east end of the overhang. At a depth of 40 cm, bedrock covered 80 percent of the unit (except for a narrow strip along the south wall). Test Unit 6, oriented to magnetic north, was set off the southwest corner of Test Unit 4. Bedrock was exposed across the unit at 70 cm.

Placed near the back wall at the northwestern margin of the western overhang, Test Unit 5 was oriented to 32°. In the northwest and southwest corners of the unit, bedrock was exposed at 17 and 21 cm, respectively. At the unit's center, decomposing bedrock was encountered at 50 cm.

Shelter A

Shelter A is located directly beneath the escarpment edge at the north-central site margin. The shelter faces south and has maximum dimensions of 19x5.4x8 m (Figure 37). Near the center of the shelter, a shallow drainage that originates on the upland surface bisects the talus edge and continues down the colluvial slope. The rim of the talus parallels, and extends an average of 2 m beyond, the edge of the overhang. Limestone spalls and cobbles are strewn along the talus, which completely lacks deposition. A pothole, measuring about 4x2x0.3 m, is present near the eastern shelter margin. Here, the floor slopes moderately east to west toward the shelter's center. At the western margin, the shelter's floor is a level surface that is slightly higher than the floor in the rest of the shelter. This area encompasses approximately 16 m^2 and was covered with military debris that included wooden pallets and crates, paper, a refrigerator, and lumber. Due to a lack of vegetation, the overall surface visibility is excellent.

Extent and Depth

Three test units spaced evenly across the shelter floor yielded cultural materials from relatively thin sediments. In Test Units 1 and 2, mixed deposits are evidenced by the presence of intrusive military items to a maximum depth of 30 cm. This disturbance resulted from vandal activity and/or severe bioturbation. Sparse or no cultural materials were recovered from seemingly intact sediments excavated to a maximum depth of 40 cm.

Sediments and Stratigraphy

Stratigraphic profiles of Test Units 1 and 2 are described in detail (see Appendix B). Test Unit 1 revealed a thin (20 cm) deposit of internally derived silts over a highly weathered, silty, limestone bedrock. The profile is divided into four zones, three of which are indicative of Type 1 rockshelter fill (Abbott 1994b). Zone 1 is a 3-cm-thick, pale brown silt with common pebble-sized and smaller spalls. Zone 2 is a 3-cm-thick, dark grayish brown silt loam with common granule-sized spalls. Zone 3 is a 14-cm-thick, pale brown silt with common spalls up to and including pebble sized. Zone 4 is a 20+-cm-thick, highly weathered, silty limestone bedrock.

Test Unit 2 consists of 22 cm of internally derived silts overlying a highly weathered, silty limestone bedrock. Four zones also were delineated in this profile. Zone 1 is a 7-cm-thick, pale brown silt with common pebble-sized and smaller spalls. Zone 2 is a 5-cm-thick, dark grayish brown silt loam with common granule-sized spalls. Zone 3 is a 10-cm-thick, dark gray silt loam with common spalls up to and including pebble sized. Zone 4 is a 4+-cm-thick, highly weathered silty limestone bedrock.

Cultural Materials

The excavations produced cultural materials consisting of 89 burned and unburned bones (including deer), 30 burned rocks, and 963 lithics (Table 15). Diagnostic lithic materials consist of the following: two arrow point blanks, one arrow point preform, one Bonham preform, one Granbury, two Scallorn, one Perdiz, and two untyped dart points. Test Unit 2 produced 98 percent (n = 946) of the prehistoric materials, including the 10 diagnostic artifacts. All but 20

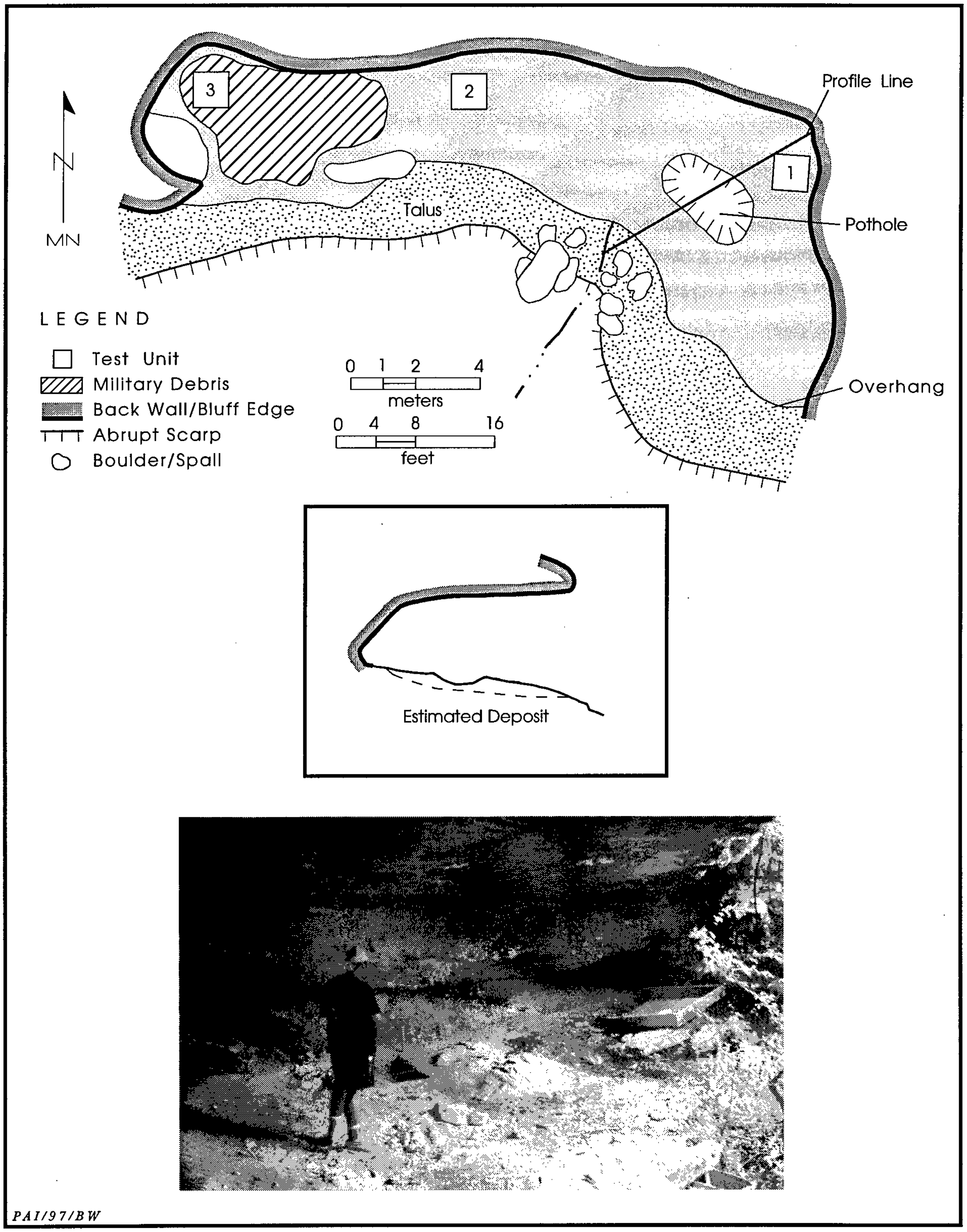

Figure 37. Photograph, plan, and profile of Shelter A, 41CV944. Photograph is of eastern half of shelter, looking northeast.

Table 15. Artifacts recovered from Shelter A, 41CV944

Artifacts	Test Unit 1	Test Unit 2	Test Unit 3	Totals
Arrow points	0	8	0	8
Dart points	0	2	0	2
Knife	0	1	0	1
Scrapers	0	6	0	6
Graver	0	1	0	1
Miscellaneous bifaces	0	1	1	2
Miscellaneous unifaces	0	5	1	6
Cores	0	2	0	2
Unmodified debitage	8	920	7	935
Totals	8	946	9	963

pieces of debitage were found at 0–20 cm. In addition, the upper 20 cm of deposits in Test Unit 2 yielded a .22-caliber cartridge case and miscellaneous fragments of cloth and metal. A military item also was noted at 20–30 cm in Test Unit 1.

Discussion

Five of the nine levels excavated in the three test units in Shelter A contained disturbed deposits. The upper deposits (i.e., above 30 cm) contained abundant prehistoric cultural remains along with evidence of recent disturbance. The thin lower deposits (i.e., below 30 cm) may be intact, but they have limited horizontal extent and produced sparse cultural materials. Based on the foregoing, this rockshelter has no research potential due to the extensive disturbances and the paucity of cultural evidence within the limited intact deposits remaining.

Shelter B

Shelter B, situated a few meters below the escarpment edge 85–90 m southeast of Shelter A, consists of three separate overhangs. Only the eastern and western overhangs contain deposits and were formally tested; these are discussed separately.

The central overhang of Shelter B measures 5x2x2.5–3 m, faces southwest, and is approximately 3 m above the base of a vertical limestone face. Drainages are present on either side of the overhang, with their sources at seeps in the limestone below the opening. The floor has a moderate to steep slope from the back wall to the opening. Surface visibility is excellent due to a lack of vegetation, and only a few centimeters of powdery silt cover the bedrock floor. The central overhang has no archeological potential, and no further work was done.

Eastern Overhang

The eastern overhang of Shelter B faces southwest and has maximum dimensions of 23x7x6 m (Figure 38). The overhang extends a minimum of 0.3 m to a maximum of 2.6 m beyond the edge of the eroded floor, which consists of cobbles, boulders, and bedrock. Near the center of the back wall, a solution cavity extends approximately 3 m north into the limestone strata and lacks deposition.

The western two-thirds of the floor is covered with a thin silt deposit overlying bedrock. The southeastern third of the shelter contains the thickest sediments. Dripline erosion impacts are ongoing, as evidenced by the formation of stalactites on the roof of the shelter along the secondary dripline. Overall, the floor slopes moderately from the opposite ends of the shelter toward its center and from north to south toward the talus edge. Lack of vegetation affords excellent surface visibility.

EXTENT AND DEPTH

Appreciable deposits are confined to an 8x4-m area near the southeastern margin. Test Units 4 and 6 yielded cultural materials to a maximum depth of 60 cm in this area. These excavations also exposed a bedrock shelf at 40 cm across most of Test Unit 4. The edge of the shelf was encountered along the southern edge of Test Unit 4, and the bedrock dipped sharply to the south to a maximum depth of 70 cm in Test Unit 6. Based on the excavation results and the natural bedrock exposures, the area containing the buried shelf measures approximately 4 m east-west by 1.5 m north-south. This area corresponds to the portion of the shelter affected by dripline erosion. The overall lack of deposition between the present edge of the shelter floor affected by the dripline and the actual edge of the overhang may be a direct result of this active erosional process.

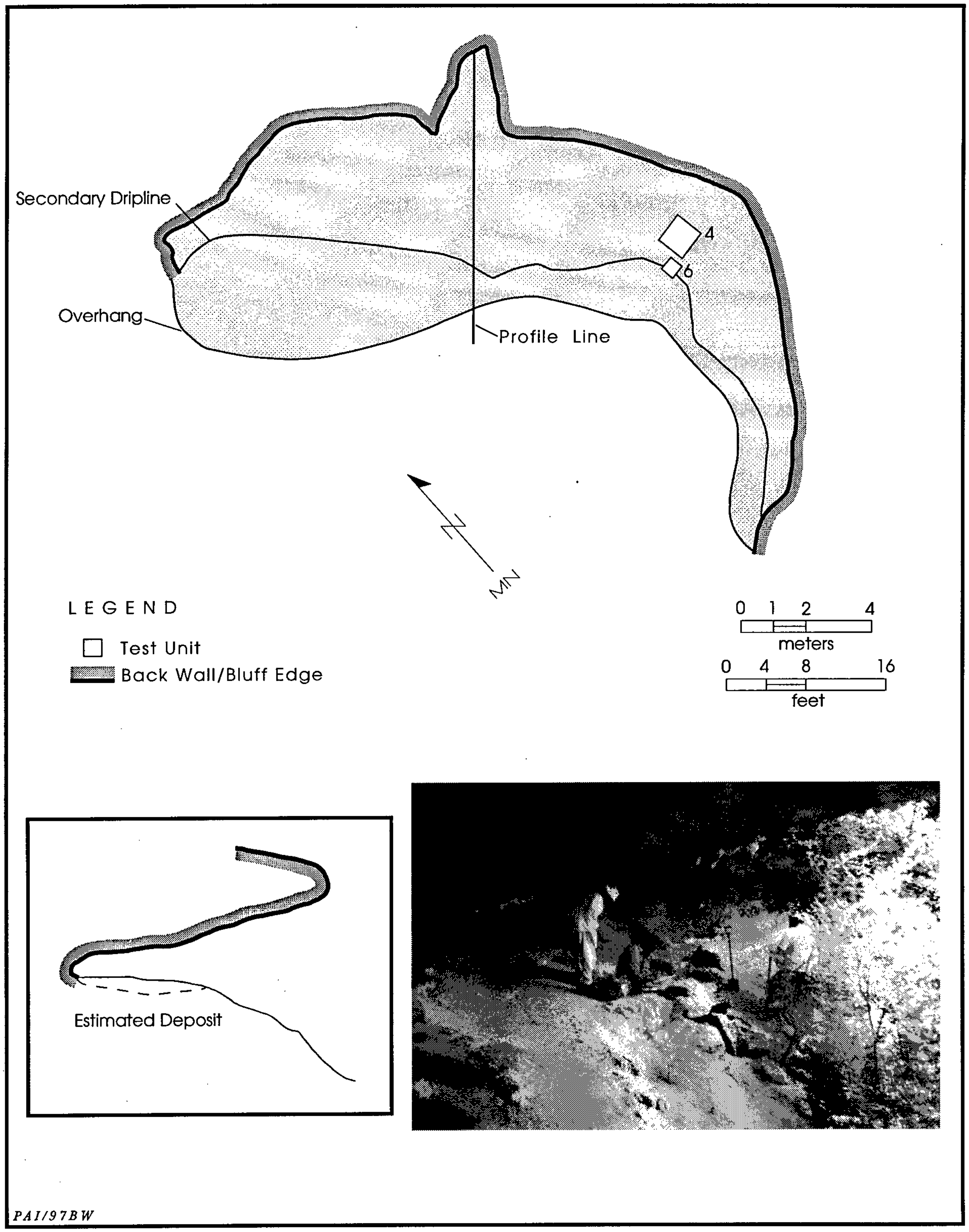

Figure 38. Photograph, plan, and profile of the eastern overhang of Shelter B, 41CV944. Photograph shows the southern half of the eastern overhang, looking southeast.

SEDIMENTS AND STRATIGRAPHY

The profile of Test Unit 4 depicts a thin mantle (21 cm) of internally derived silty deposits overlying a highly weathered, silty limestone bedrock (see Appendix B). Three zones were delineated in the profile. Zone 1 is a 5-cm-thick, very pale brown silt with common spalls up to and including cobble sized. Zone 2 is a 16-cm-thick, very pale brown silt with common pebble-sized and smaller spalls. Zone 3 is a highly weathered silty bedrock that is greater than 12 cm thick.

CULTURAL MATERIALS

Most (80.7 percent) of the cultural materials were found at 10–30 cm. The assemblage consists of 74 pieces of debitage, 1 knife, charcoal, and 3 burned rocks. Other items include 3 small rodent bones that are probably intrusive.

DISCUSSION

Prehistoric cultural materials are present in silty endogenous Holocene deposits derived from weathering of the wall and the ceiling of the shelter. These materials are compressed in thin unconsolidated sediments that have been, and continue to be, reworked by dripline erosion. The eastern overhang has no research potential due to the lack of stratigraphically discrete components or occupational zones in these thin deposits.

Western Overhang

The western overhang of Shelter B has maximum dimensions of 14x4x3 m and faces south (Figure 39). The overhang is 4 to 5 m above the base of a vertical limestone face, with access at its southeast margin. At the westernmost edge of the overhang, a relatively flat portion of the floor measuring 4.4x3 m is the only area that contains any appreciable deposits. Here, the height of the overhang ranges from 0.45–1.25 m. From the eastern edge of this level section, the floor slopes dramatically and continuously to the east. Due to the floor's gradient, the roof near the center of the shelter is over 2 m high. At the northeast corner, a small solution cavity has formed in the back wall. Bedrock is exposed just beyond the edge of the overhang, with the talus comprised only of boulders and smaller roof-fall fragments. Due to the lack of vegetation, surface visibility is excellent.

EXTENT AND DEPTH

Although the maximum floor dimensions cover an area of 56 m^2, only 13.2 m^2 exhibit appreciable sediments. A single 1x1-m test unit excavated in this area (Test Unit 5) contained cultural materials from the surface to 40 cm; bedrock was encountered at 50 cm.

SEDIMENTS AND STRATIGRAPHY

The stratigraphic profile of Test Unit 5 reveals a shelter fill consisting of internally derived sediments and spalls. The shelter fill can be divided into two zones, a 10-cm-thick brown silt overlying a pale yellow silt 12–40 cm thick. Spalls increase in frequency with depth until bedrock is encountered at 17 to 50 cm.

CULTURAL MATERIALS

Four pieces of debitage and one miscellaneous biface were recovered at 0–40 cm in Test Unit 5. The upper 40 cm also yielded 24 unburned bone fragments, mostly of small animals. The latter are probably noncultural.

DISCUSSION

Sparse cultural materials were recovered from the thin, unconsolidated silty deposits. Based on the foregoing, separable cultural deposits cannot be distinguished either horizontally or vertically.

41CV1348

Site Setting

Site 41CV1348 is located near the foot of a Manning surface remnant and encompasses two rockshelters, several alluvial fans, steep to gentle slopes, and the floodplain along Turnover Creek (Figure 40). The escarpment rim parallels the western site boundary, and the rockshelters are located directly below the edge of the upland along the northwestern site margin. The alluvial fans and slopes comprise approximately 85 percent of the site. These moderately to severely disturbed areas are covered by patches of juniper and scrub oak. Turnover Creek and a narrow strip of Holocene terrace delimit the southern site margin. Surface visibility is extremely poor due to grass cover and secondary vegetative growth. The site elevation is 280–300 m above mean sea level.

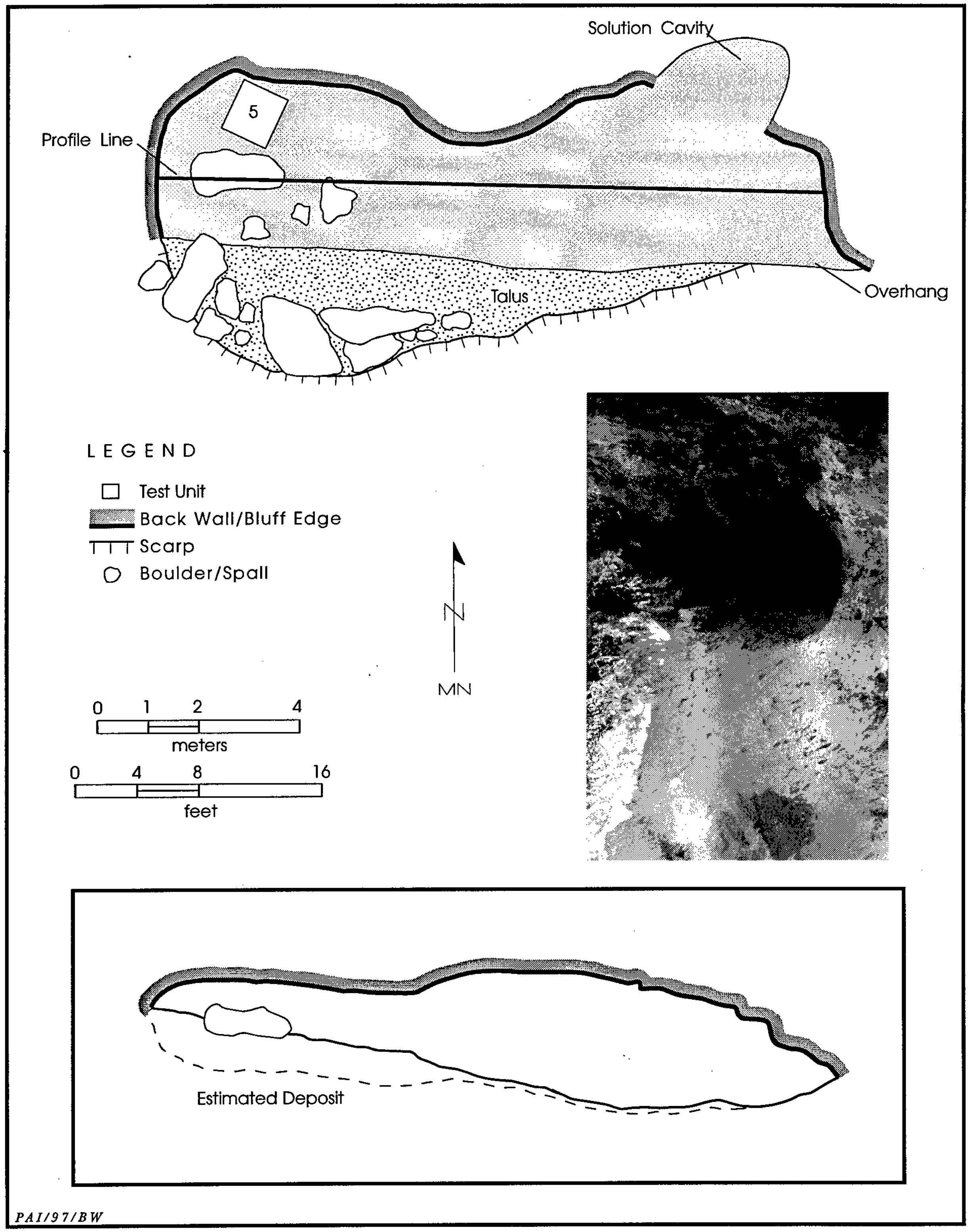

Figure 39. Photograph, plan, and longitudinal profile of western overhang, Shelter B, 41CV944. Photograph view is west.

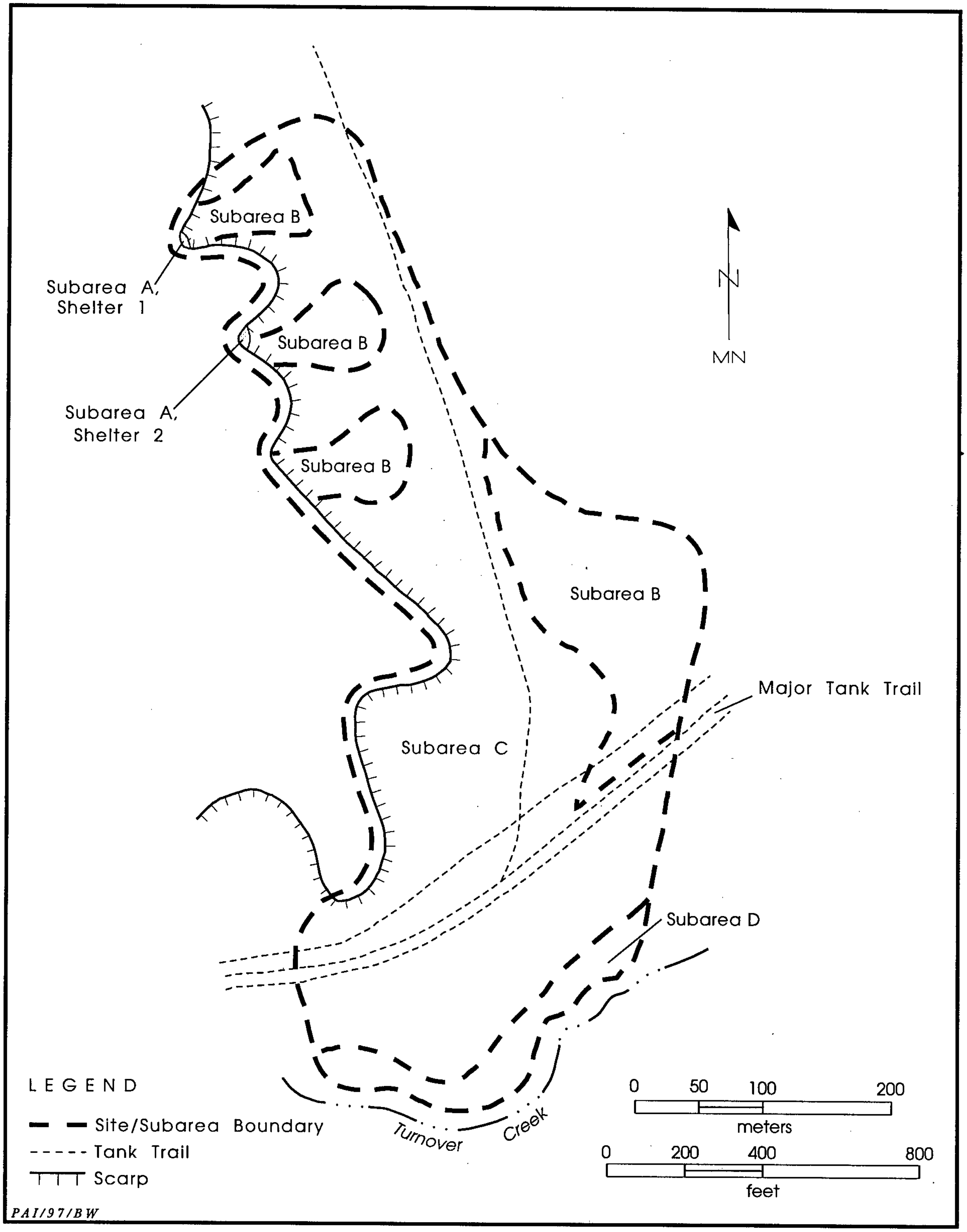

Figure 40. Site map of 41CV1348 (modified from Trierweiler, ed. 1994:A1478).

Previous Work

Mesrobian, Dureka, Strychalski, Rotunno, and J. Masson (Texas A&M University) recorded the site on 7 and 12 November 1986. The site subsumed the upland slopes, benches, and draws and included a burned rock and lithic scatter, with middens noted on the slopes north of Turnover Creek. Cultural materials consisted of debitage, bifaces, scrapers, retouched flakes, cores, hammerstones, and a mano. Three untyped dart points were collected. It was estimated that 90 percent of this area had been disturbed by erosion, vehicles, bivouac, a borrow pit, an historic habitation, and animals. In addition, the site contained one rockshelter and one sterile overhang. One biface, flakes, and sparse burned rocks were observed eroding out of the rockshelter deposits. These deposits were thought to be thick, which suggested that a buried cultural layer might be present. At least 45 percent of the shelter had been impacted by erosion, bivouac, and animals. Since its overall dimensions were greater than 75,000 m^2, the site was later classified as a lithic resource procurement (LRP) area for management purposes.

On 31 December 1992 and 4 February 1993, Mehalchick and Frederick (Mariah Associates) revisited and reevaluated the site. The site was situated at the foot of a north-south-trending Manning surface remnant and encompassed a wide variety of contextual environments. Based on differential archeological potential and geomorphic contexts, the site was divided into Subareas A–D. Since portions of the site had the potential for buried cultural deposits, a crew excavated 57 shovel tests in February and March of 1993.

Subarea A included Shelters 1 and 2, situated near the heads of small easterly flowing drainages near the north end of the site. Within a complex of rock overhangs located at several different levels, Shelter 1 is the lowermost overhang. It is the only one with any significant deposits. In 1991, it was estimated that this shelter's fill was dominated by 30–60 cm of internally derived matrix. It was noted that this deposit had a rather steep surface slope adjacent to the back wall of the shelter, but that it was relatively flat in the center of the shelter. The northern and western sides of this level area had been significantly eroded by surface waters entering the shelter from the north-northwest. However, a thin veneer of externally derived, dark-colored fine sediment, deposited on top of angular limestone pebbles and cobbles, remained. Another wedge of externally derived sediment encroached on the center of the shelter from the northeast. The shelter floor was primarily covered with leaf litter and limestone spalls, affording very poor surface visibility. However, a few burned rocks were exposed at the east edge of the floor. Erosion and animals had minimally impacted the areas where deposits remained. Three shovel tests were excavated in Shelter 1 and all were culturally sterile. Bedrock was reached between 23 and 50 cm. Although no demonstrated cultural deposits were encountered during shovel testing, the shelter appeared to have the potential to address paleoenvironmental issues since a portion of it was dry and appeared undisturbed.

Shelter 2, previously recorded as a sterile overhang in 1986, is situated at the head of a small canyon at a knickpoint in a first-order stream draining the Manning surface. The stream channel cut across the shelter and had eroded away all the deposits along its north-northeastern end. At the southern end of the shelter, a narrow bench of externally derived sediments containing numerous granule- to boulder-sized limestone clasts, presumably introduced into the shelter by weathering of the wall and roof was noted. A solution pipe or spring conduit with a very low overhang was observed at the southern end of the shelter and extended more than a meter back into the limestone. Overall surface visibility was extremely poor, with leaf litter and limestone spalls obscuring most of the shelter's floor. No cultural materials were observed. A few recent animal bones were found at 0–20 cm in one shovel test that reached bedrock at 35 cm.

Subarea B includes three alluvial fans formed at the point where upland streams flow onto the broad gentle slope that grades down to Turnover Creek. These fans had been substantially disturbed by tank maneuvers, but some intact portions appeared to be present. Due to limited field exposure, the character of the deposits was difficult to ascertain, but there appeared to be a relatively thin A-Bw-C soil profile formed in some of the material. It was difficult to tell if these deposits were Holocene fans or residual soils formed in marl. A fourth area included in this subarea was a patch of relatively

intact soil assumed to be either minimally disturbed colluvium or a rather immature residual soil. A scatter of lithics and burned rocks was noted across the surface of Subarea B, but only 6 of 37 shovel tests (16 percent) contained prehistoric materials. Subsurface disturbance was evidenced by the recovery of historic materials from 13.5 percent of the 37 shovel tests. Based on these results, the potential for intact cultural deposits in Subarea B appeared to be minimal.

Subarea C subsumed the majority of the site and consisted of the heavily disturbed surface upon which the fans were constructed and the steeply sloping margins of the Manning surface. Although some of this surface may have supported a veneer of Holocene sediment at one time, the exposures exhibited either bare limestone or remnants of an A-Bt-K-R profile indicative of a very old, presumably residual, soil. Flakes, burned rocks, bifaces, cores, and scrapers were visible across this surface. Since the potential for intact cultural deposits was nonexistent in Subarea C, shovel testing was not warranted.

Subarea D, at the southern site margin, includes a narrow strip of the Turnover Creek floodplain which appears to contain several alluvial fills. The oldest of these fills is present under the T_2 surface, which lies about 3 m above the channel and exhibited an A-Bt-K-R profile. This was inferred to correlate with the Jackson alluvium. Several fills are present beneath the T_1/T_0 surface, which represents a complex, undifferentiated surface 1 to 1.5 m above the thalweg of Turnover Creek. One fill, presumably West Range alluvium, was observed beneath this surface and consisted of a dark-colored alluvium with an A-AC-C soil profile. Inset into this unit is a thin veneer of coarse-grained, pedogenically unmodified alluvium; it was inferred to correlate with the Ford alluvium. The West Range fill is in turn inset into an older fill that is yellow to gray in color and exhibits an A-Bk-C profile with a stage 2 calcic horizon. The color and relative stratigraphic position of this fill suggested that it may correlate with Georgetown alluvium. A light scatter of burned rocks, bifaces, and flakes was observed, but visibility was very poor due to dense vegetative cover. The 1986 site form noted burned rock middens just north of Turnover Creek, but no descriptions or locations were given. No evidence of these middens or any other types of features were located during the December 1992 and February 1993 investigations. Sixteen shovel tests excavated to 40 cm were culturally sterile. Nonetheless, the potential for in situ cultural remains below the level of shovel testing existed based on the overall thickness of the Holocene deposits.

Abbott and Kleinbach (Mariah Associates) revisited the site on 3 June 1993 to evaluate its potential utility to address questions of lithic resource procurement and reduction. Because no chert resources were observed, it was excluded from resurvey.

Based on the foregoing, the site was divided into four Management Units. Shelters 1 and 2 in Subarea A were defined as Management Units 1 and 2, respectively. Subarea D was designated Management Unit 3, whereas Subareas B and C comprised Management Unit 4. Since Management Unit 4 had no potential for intact cultural deposits, it was considered to be ineligible for listing in the NRHP and no further work was recommended. Management Units 1, 2, and 3 were recommended for formal testing since all three potentially contained intact cultural deposits of unknown significance. The recommended minimum testing effort was at least one manually excavated test pit (1x1 m) in each rockshelter (Management Units 1 and 2) and six backhoe trenches in the terrace (Management Unit 3) to assess NRHP eligibility (Trierweiler, ed. 1994:A1477–A1481).

Work Performed

Although Subareas A and D of this site were recommended for formal testing, the scope of work only required assessment of Subarea A, Shelters 1 and 2. Formal testing of Subarea A was completed on 11 September 1995. The test excavations included two 1x1-m units (Test Units 1 and 3) in Shelter 1 and one 1x1-m unit (Test Unit 2) in Shelter 2. A total of 1.8 m³ was manually excavated.

Test Unit 1 was placed approximately 1 m north of the back wall near the eastern margin of Shelter 1. The unit was oriented to 8° and bedrock was encountered at 60–80 cm (east to west). Oriented to 22°, Test Unit 3 was excavated at the center of the shelter 4 m west of Test Unit 1 and 1.5 m east of the drainage that enters the shelter. Bedrock, dipping from south to north, was exposed at 10–50 cm.

At the eastern margin of Shelter 2, Test

Unit 2 was placed adjacent to the back wall and just within the overhang (oriented to 10°). Decomposing bedrock was encountered across the unit at 42–50 cm. Overall, 70 percent of the fill consisted of limestone spalls.

Shelter 1

Extent and Depth

Shelter 1 faces northeast and has maximum dimensions of 16x5x1.5 m (Figure 41). The eastern half of the shelter consists of deposits that slope moderately from east to west towards the shelter's center, which is relatively level. The sediments are contained within the overhang, which extends 1.5–5 m from the back wall to the dripline. Bioturbation is minimal in this area. A drainage enters the shelter at its western margin, flows southeast toward the center of the shelter, and exits downslope to the north. This section is strewn with fist-sized and larger cobbles and lacks any appreciable deposit due to sheet flow. Lack of vegetation affords excellent surface visibility, with oak and cedar elm trees along the talus edge.

Deposition is primarily restricted to the eastern half of the shelter and covers an area about 35 m^2. Sparse cultural materials, consisting of eight burned and unburned bones, one unmodified mussel shell valve, and one piece of debitage were found to a maximum depth of 80 cm.

Sediments and Stratigraphy

Abbott (1994b:346) interpreted the fill of Shelter 1 as indicative of rockshelter sediment Types 1 and 3. The profiles of Test Units 1 and 3 support this interpretation. In the east wall profile of Test Unit 1, Zone 1 is a 16-cm-thick, dark grayish brown sandy clay loam with common pebble-sized and smaller spalls. It is a mix of externally derived organic materials (i.e., leaves and twigs) and internally derived spalls and silts. Zone 2 is a 19-cm-thick, very pale brown sandy loam with many spalls up to and including pebble sized. Zone 3 is a 15-cm-thick, very dark grayish brown clay loam with many cobble-sized and smaller spalls. Zone 3 primarily consists of externally derived sediments (most likely eroded from upland soils) overlying the westward-dipping limestone floor.

Three zones were delineated in the downslope profile (north wall) of Test Unit 3. Zone 1 is a 9-cm-thick, very pale brown silt loam with a few pebble-sized and smaller spalls. Zone 2 is a 12-cm-thick, very pale brown silt loam with a few small pebble-sized spalls. Sediments and clasts in Zones 1 and 2 are derived from weathering of the limestone walls and ceiling of the shelter. Zone 3 is 22-cm-thick, dark brown clay loam with many spalls, up to and including cobble sized. Zone 3, resting on the northward-dipping limestone bedrock, consists of externally derived sediments and is a lateral extension of Zone 3 in Test Unit 1. Due to the slope of the bedrock floor, this zone does not extend to the back of the shelter, as evidenced in the east and west wall profiles of Test Unit 3.

Discussion

Only 5 of 13 levels (38 percent) excavated in two test units yielded cultural materials. These five positive levels produced 10 artifacts, of which 8 are bone fragments found at 0–30 cm in Test Unit 1. In addition to the sparse recovery, the contextual integrity of the cultural materials is dubious. The eastern half of the floor slopes moderately east to west, and a drainage that originates on the uplands flows southeast from the western end of the shelter toward the center before exiting the shelter. This drainage, along with the presence of cultural materials within a deposit that consists predominantly of externally derived sediments, suggests redeposition. Thus, the results of formal testing, in addition to previous investigations (i.e., three sterile shovel tests), indicate that Shelter 1 lacks intact cultural deposits.

Although the archeological potential is extremely poor, the shelter's intact and horizontally continuous stratigraphy is rare for rockshelters at Fort Hood. Therefore, the shelter appears to have a great potential for yielding paleoenvironmental and rockshelter developmental information.

Shelter 2

Extent and Depth

Shelter 2 is 70–75 m southeast of Shelter 1. It faces northeast and has maximum dimensions of 14x2x1 m (Figure 42). A small alcove formed by a spring conduit is located along the back wall.

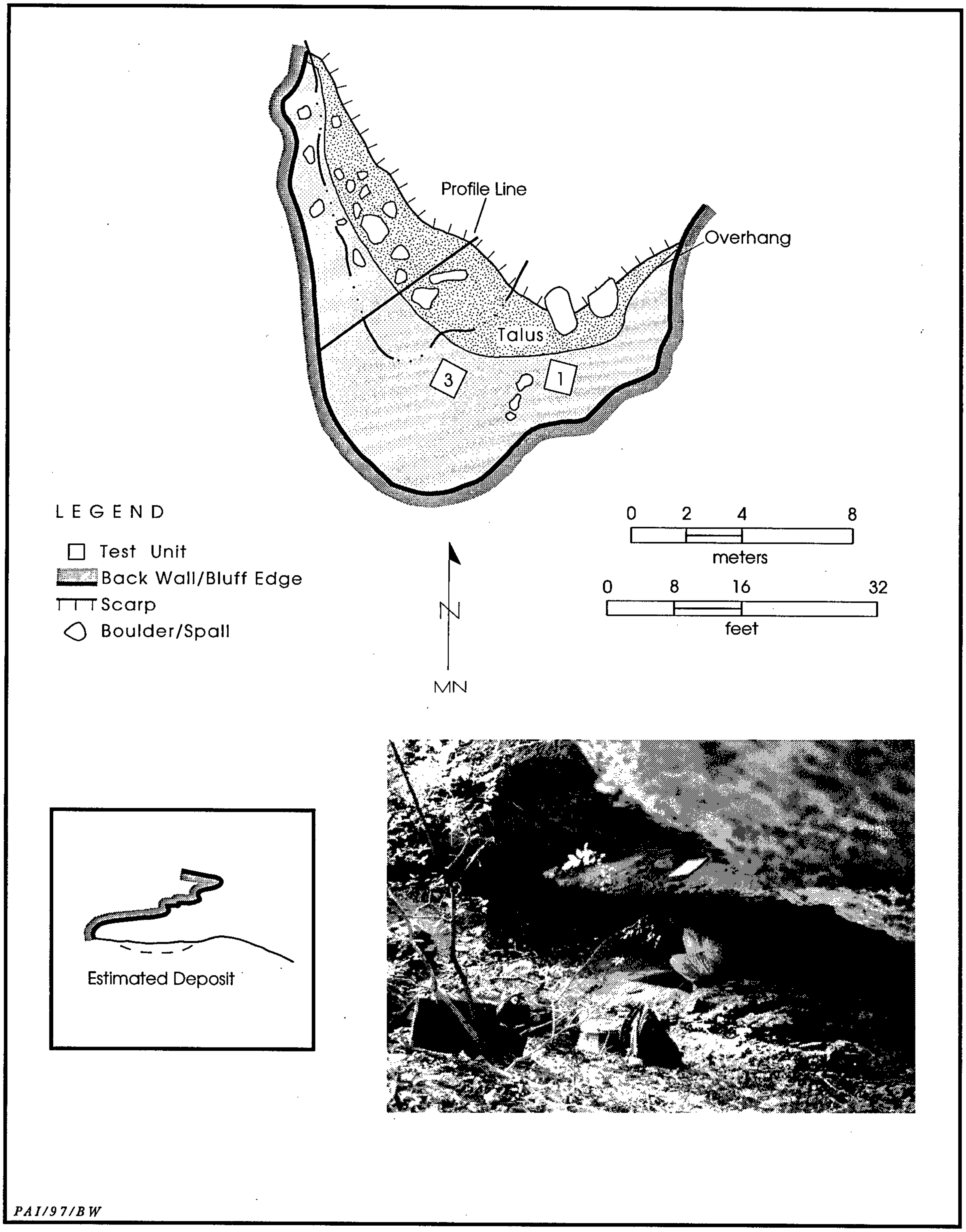

Figure 41. Photograph, plan (modified from Trierweiler, ed. 1994:A1479), and profile of Shelter 1, 41CV1348. Photograph view is southwest; Test Unit 3 excavation is in progress.

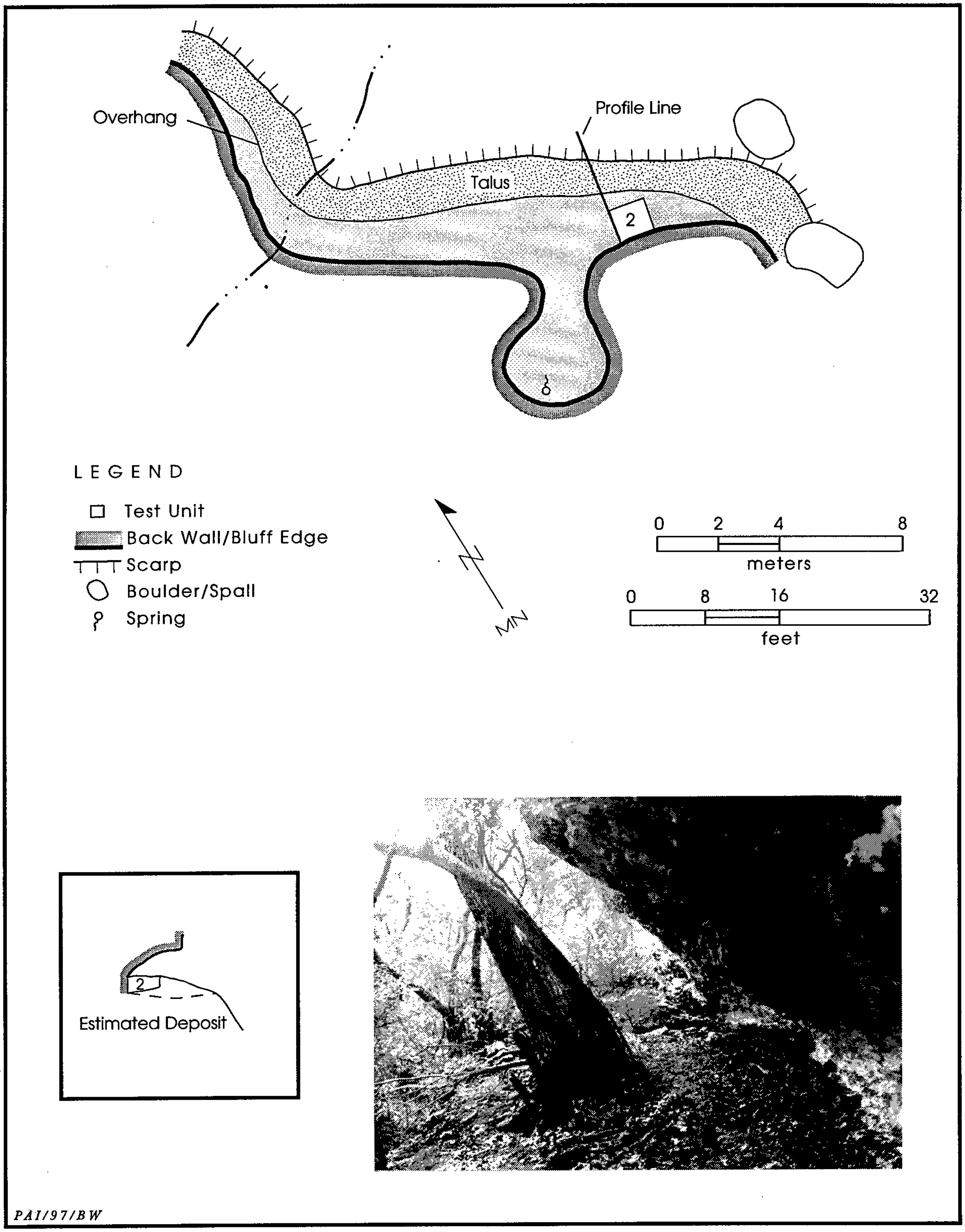

Figure 42. Photograph, plan (modified from Trierweiler, ed. 1994:A1479), and profile of Shelter 2, 41CV1348. Photograph is an overview of Shelter 2, looking east; Test Unit 2 is in the center.

Its maximum dimensions are 3x2 m, and it is not more than 30 cm high. Excluding the alcove, the overhang extends 1.5 to 2 m from the back wall to the dripline. An externally derived sediment mixed with limestone clasts is present within the overhang. Surface visibility is poor due to leaf litter from nearby oaks and limestone spalls. However, erosion and bioturbation have minimally impacted the sediments. Devoid of soil, the talus edge extends 1–2 m beyond and parallels the edge of the overhang. A drainage originating on the uplands cuts across the eastern end of the overhang.

The maximum length-to-depth ratio of the shelter floor is 5:1, with less than 8.5 m^2 of sediment preserved in a very narrow strip. No cultural materials were recovered from five levels excavated in Test Unit 2.

Sediments and Stratigraphy

The profile of Test Unit 2 is indicative of sediment Type 3, which concurs with Abbott's (1994b:346) interpretation of the shelter fill. Stratigraphic zones or soil horizons are not discernible in the profile (see Appendix B). The 38-cm-thick profile consists of a very dark grayish brown clay loam with many cobble-sized and smaller spalls. The externally derived sediments rest on bedrock, while tufa deposits are present along the back wall of the shelter.

Discussion

No cultural materials were recovered in the past (one sterile shovel test) or present excavations in Shelter 2. The absence of occupational evidence indicates that this shelter has no archeological potential and is not culturally significant.

SITE 41CV1473

Site Setting

Site 41CV1473 is located on the alluvial terraces south of the Leon River (Figure 43). The site is transected by a number of small north-south trails, and a wider gravel road cut generally parallels the southern boundary of the site near the front edge of the terrace. The southwestern boundary of the site extends ca. 50 m south of this road into a level area on the T_2 terrace that had been previously cleared of trees and now supports a fairly dense mesquite and juniper forest. From the edge of the level T_2 terrace, the site extends downslope (north) to its contact with the floodplain of the Leon River. This area of the site, the sloping interface between the T_2 and T_0 terraces, is covered by a dense mixed hardwood forest. In addition to the numerous roads, the site has been highly disturbed by erosion, pedoturbation, and military training activities (i.e., tank maneuvering). Site elevation is 230 m above sea level.

Previous Work

The site was first recorded on 25 January 1990 by Sanchez, Kleinbach, Sanderfur, and Cargill (Texas A&M University). Site dimensions were defined as 340 m east-west by 150 m north-south. Two burned rock scatters (Features 1 and 2) and two lithic concentrations (Features 3 and 4) were described and plotted, and numerous lithics, burned rocks, and mussel shells were noted in erosional exposures. The front edge of the terrace was observed to contain the highest density of artifacts as well as the four features. The presence of a large number of flakes representing all stages of reduction, along with the absence of formal tools, suggested to the investigators that a large amount of lithic reduction had occurred and that diagnostics (projectile points) may have been collected from the site. About 75 percent of the site had been impacted by erosion, artifact collecting, and road construction. Nevertheless, the potential for shallowly buried cultural deposits (20+ cm), indicated by materials exposed in erosional scars, was considered to be good. Therefore, the site was considered potentially eligible for listing in the NRHP, and subsurface testing was recommended (Carlson et al. 1994:71).

Subsequent to the original description of 41CV1473, Nordt (1992) conducted a geomorphological investigation of the Leon River terrace on which the site lies as part of a general study of alluvial units within Fort Hood. On the basis of two backhoe trenches located near the site, including one just inside the eastern site boundary, Nordt (1992:Figure 24) identified this as a T_2 terrace dating to approximately 15,000 B.P. and coeval with the Jackson alluvium on other streams at Fort Hood. Consequently, the site was

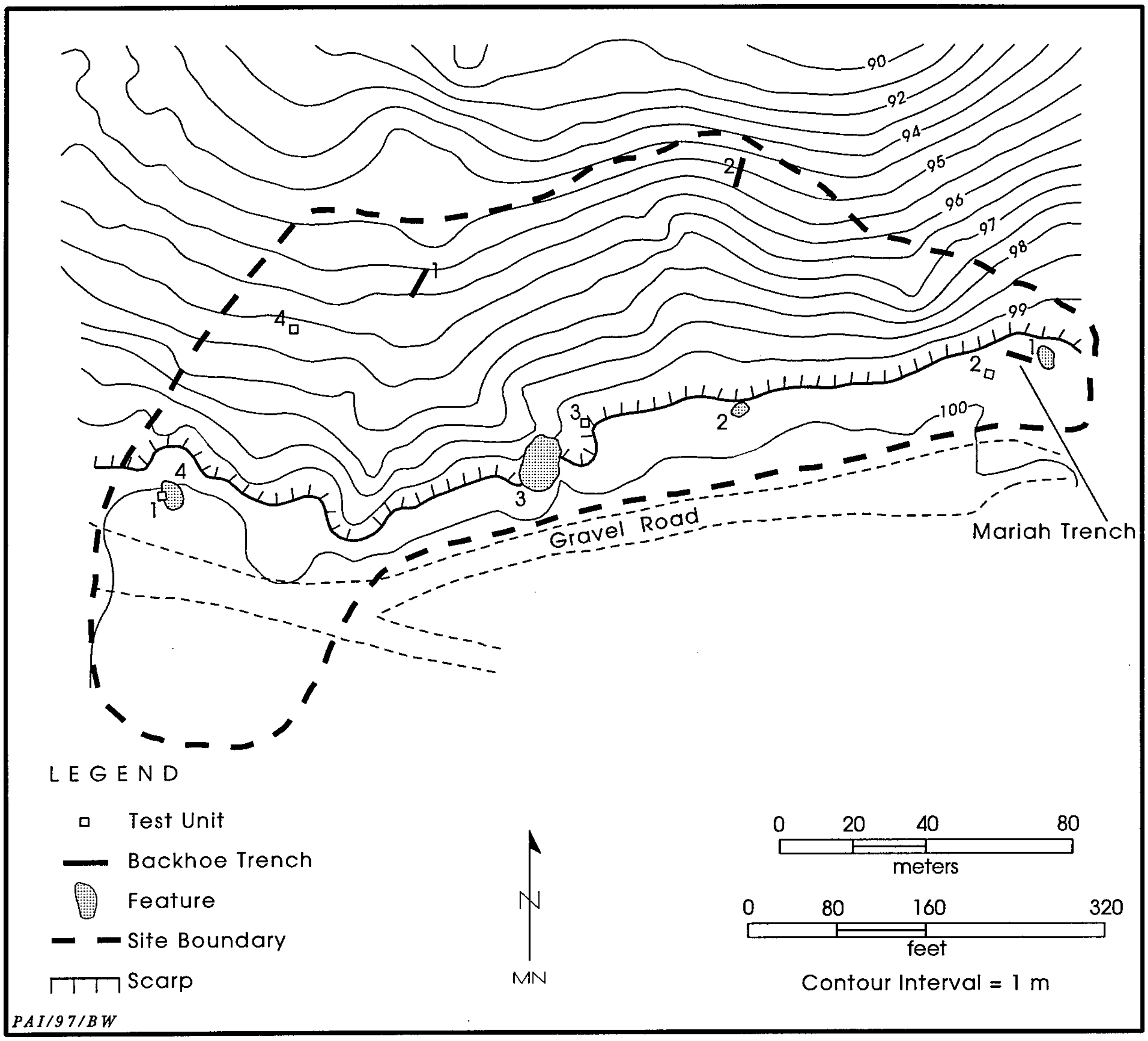

Figure 43. Site map of 41CV1473.

expected to be primarily surficial, with any subsurface cultural manifestations limited to either features cut into the old land surface or the subsidence of surface materials into the sandy A and BAt matrices of the old landform.

The results of National Register testing at 41CV1472, located immediately east of 41CV1473 on the edge of the Leon River T_2 terrace (Trierweiler 1996), are noteworthy in regard to 41CV1473. At the time of testing, investigators noted the colluvial nature of this portion of the landform and described in detail the geomorphic stratigraphy in several backhoe trenches. They interpreted the geomorphic data as evidence that the cultural deposits at 41CV1472 had been reworked colluvially.

Work Performed

Formal testing of 41CV1473 was completed in early July 1995. Two backhoe trenches and four 1x1-m test units were excavated. A total volume of 1.5 m³ was manually dug. Both of the backhoe trenches were placed just above the interface of the T_2 and T_0 terraces of the Leon River because this area exhibited the greatest depths of deposits and contained the highest potential for natural stratigraphic separation.

Backhoe Trench 1 (5x0.8x1.4 m) was placed in the lower west-central portion of the site, and Backhoe Trench 2 (10x0.8x1.8 m) was placed along the lower east-central margin. Backhoe Trench 1 was oriented to 207° and Backhoe Trench 2 to 195°. No cultural materials were observed within either trench. Test Units 1 and 2 were placed at the edge of the level T_2 surface. Test Unit 1, oriented to 342°, was placed near the western margin of the site adjacent to Feature 4. Test Unit 2 was placed at the eastern boundary of the site ca. 10 m southwest of Feature 1. Test Unit 3, oriented to 320°, was placed in the midportion of the site, just below the edge of the level T_2 surface. Test Unit 4 was placed on the slope ca. 15 m southwest of Backhoe Trench 1. Test Units 2 and 4 were oriented to magnetic north.

Extent and Depth

Cultural materials were found to be restricted to the loosely consolidated Holocene sands that overlie the Pleistocene surface. These sands, ranging from 20 to 50 cm thick, occur across the majority of the 150x340-m site, although several areas along the edge of the level T_2 terrace have been deflated as a result of localized erosion.

Sediments and Stratigraphy

The excavations revealed a continuous Holocene colluvial mantle overlying the T_2 terrace surface and the sloping interface between the T_2 and the T_0 terraces. Backhoe Trench 1 is representative of the site's stratigraphy as a whole. The profile documented in this trench (see Appendix B) consists of three zones (A-2Bt-2Ck profile) that are present across the site but vary in thickness, texture, and color. Zone 1 is a dark grayish brown silt loam representing a colluvial drape of reworked terrace surface sediments, small gravels, and organically derived detritus. Underlying this mantle are two zones (2Bt and 2CK horizons) representing a truncated soil. Upslope, the 2Bt horizon (Zone 2) consists of a strong brown mottled silty clay loam that is shallowly buried under less than 20 cm of Holocene colluvium. A calcic 2Ck horizon (Zone 3), consisting of a brownish yellow silt loam containing many caliche nodules, underlies the 2Bt horizon. The mottled nature and pedogenic carbonate morphology of these two zones are of great antiquity. This evidence, along with the geomorphic setting of the landform, indicates that Zones 2 and 3 most likely represent a truncated paleosol within late Pleistocene Jackson alluvium as defined by Nordt (1992).

Cultural Materials

The majority of the cultural materials were recovered in the excavation units located at the edge of the level T_2 surface, but artifacts were found in all four test units. Generally the upper two levels of each unit contained the highest artifact frequencies, with numbers decreasing with depth. A wide variety of artifacts was recovered from the test units, including 2 untypeable arrow points, 1 untypeable dart point, 57 stone tools, 7 cores, and 2,149 pieces of unmodified debitage (Table 16). In addition, a Zephyr dart point was collected from the surface in the vicinity of Feature 3. Other materials recovered from test units include 1 highly weathered bone fragment, 25 fragmented burned rocks, and several recent military items (i.e., cartridge cases).

Table 16. Artifacts recovered from 41CV1473

Artifacts	Test Unit 1	Test Unit 2	Test Unit 3	Test Unit 4	Totals
Arrow points	1	1	0	0	2
Dart point	0	0	0	1	1
Gouge	1	0	0	0	1
Knives	4	9	0	1	14
Scrapers	2	16	0	0	18
Gravers	2	0	0	0	2
Multifunctional tool	0	1	0	0	1
Miscellaneous bifaces	2	5	0	0	7
Miscellaneous unifaces	6	8	0	0	14
Cores	2	5	0	0	7
Unmodified debitage	818	1,186	88	57	2,149
Totals	838	1,231	88	59	2,216

Cultural Features

No subsurface features were encountered, but the four previously identified surface "feature areas" were re-located and recorded. Each feature is located at the edge of the level T_2 surface (see Figure 43), and they are designated from east to west across the site as Features 1–4, respectively.

Feature 1 is located within an eroded trail at the eastern edge of the site. Where the trail crests the terrace, a small number of scattered burned rocks are present within a 4x2-m area. In this area and for approximately 6 m downslope, high frequencies of debitage were observed along the edges of the trail. Feature 2, previously described as a burned rock scatter, is a 4-m-diameter, low push pile containing burned rocks and debitage along with historic (or recent) materials (i.e., glass and whiteware). Feature 3 is an eroded area measuring approximately 10 m in diameter. It contains a high density of debitage exposed on the surface of the Pleistocene clay. One Zephyr dart point was collected. Feature 4 is located within a 9x4-m area along an eroded trail near the west site boundary. High frequencies of lithic debitage and scattered burned rocks, a few biface fragments, and two quartzite hammerstones were observed. Test Unit 1 was excavated to investigate this feature. Although hundreds of flakes, 21 fragmented burned rocks, 1 untypeable arrow point, and 1 bone fragment were recovered, the 20-cm-thick feature deposits lack integrity as evidenced by recent items mixed within the unconsolidated sandy matrix.

Discussion

The dart and arrow points indicate that site 41CV1473 was occupied during the Late Archaic and Late Prehistoric periods. However, it is likely that many formal tools have been collected from the site, and this, along with the relatively high frequencies of lithic debitage, suggest that it may have been utilized for an even greater time span. The four test units, along with surface observations of features, provide evidence of stratigraphically inseparable occupations contained within the thin (<40 cm) unconsolidated sandy deposits. Geomorphically, this unconsolidated sand represents sediments that accumulated on a stable surface in Late Pleistocene times and have been reworked and bioturbated since then. Despite the high density of cultural materials, the contextual integrity of the archeological materials is extremely poor.

41CV1478

Site Setting

Site 41CV1478 is situated south (upstream) of the confluence of the Leon River and Turnover Creek on the north bank of a large meander of Turnover Creek. The cutbank, ranging from 2 to 4 m high, is vertical to gradually sloping. The area is presently used as pasture, and the only noticeable impacts are erosion and a north-south dirt road that bisects the site. Vegetation consists of an oak-juniper-mesquite woodland, with leaf litter and grasses completely obscuring the ground surface. Site elevation is 230 m above mean sea level.

Previous Work

On 5 February 1990, Sanchez, Kleinbach, and Brown (Texas A&M University) recorded the site. In the cutbank of Turnover Creek, lithics, burned rocks, bones, and mussel shells were buried approximately 200 cm below the surface. A probable hearth consisting of oxidized soil, charcoal, and possible ash also was exposed in this apparent cultural layer. A charcoal sample was collected from the feature area. Sterile deposits above and below the cultural materials suggested that an intact buried occupation was present. An estimated 60 percent of the site had been disturbed by erosion. When recorded, the site was considered too deep to shovel test, and additional testing was recommended since the site was considered to be potentially eligible for listing in the National Register of Historic Places (Carlson et al. 1994:72–73).

Work Performed

Prior to excavation, the Turnover Creek cutbank was reinspected, but no cultural materials or features were observed. Formal testing was completed on 13 July 1995 (Figure 44). The test excavations included three backhoe trenches (Backhoe Trenches 1–3), two 1x1-m test units (Test Units 1 and 2), and one 100x64-cm unit (Test Unit 3). A total of 4.7 m^3 was manually excavated.

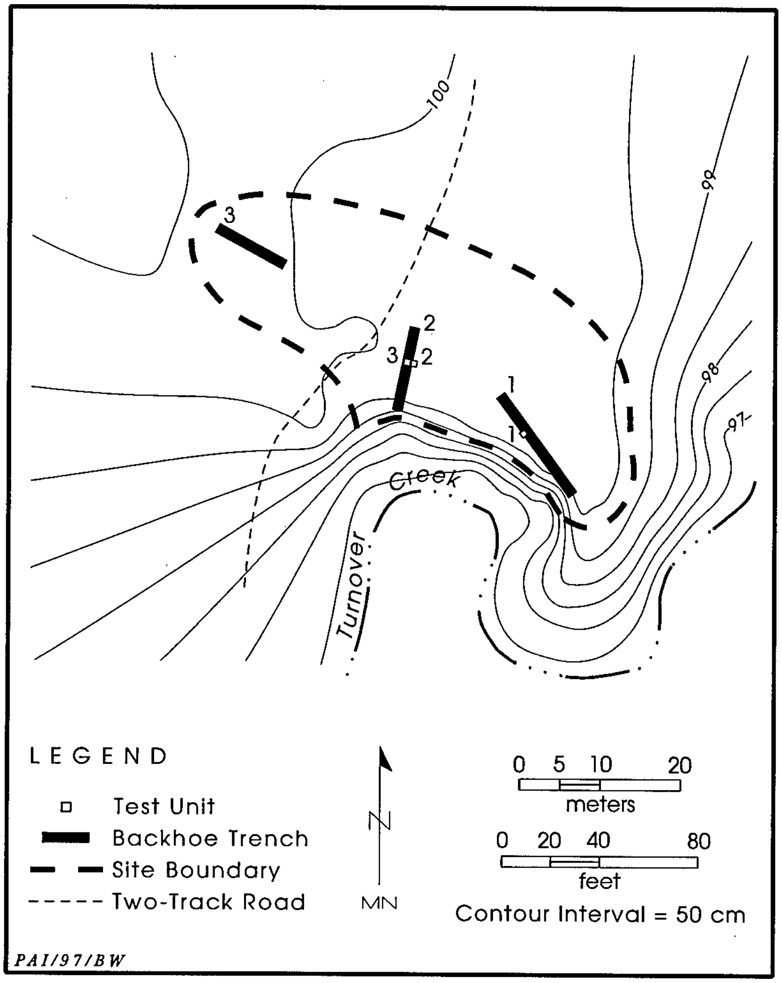

Figure 44. Site map of 41CV1478.

Backhoe Trench 1 was placed perpendicular to the cutbank at the southeastern site margin. The trench was oriented to 330° and measured 12x1.5x3.1 m. At approximately 200 cm, burned rocks, mussel shells, and charcoal were exposed in the west wall. This lens of cultural materials was 5 m long and sloped gradually from north to south toward the creek. West of Backhoe Trench 1 and in the central portion of the site, Backhoe Trench 2 was excavated perpendicular to the cutbank. Oriented to 11°, the trench had dimensions of 10x1.5x3.3 m. At 170 cm, a burned rock feature was encountered in the bottom of the trench's north end. The water table was reached at a depth of ca. 330 cm near the center of the trench. Backhoe Trench 3 (7x1.5x2.5 m) was located 20 m northwest of Backhoe Trench 2 and was oriented to 300°. Occasional burned rocks were exposed at 140–150 cm.

Excavated to 220 cm, Test Unit 1 was placed along the west wall of Backhoe Trench 1 above the exposed cultural lens. Excavated to 210 cm, Test Unit 2 was placed adjacent to the east wall of Backhoe Trench 2 directly above the burned rock feature. Due to the presence of burned rocks in the bottom of Backhoe Trench 2, Test Unit 3 was placed inside the trench contiguous with the west wall of Test Unit 2. Since the test unit was located at the base of the trench, its maximum dimensions were 100 cm north-south by 64 cm east-west. The upper 166 cm of deposits were removed during trenching; therefore, excavation of Test Unit 3 began with Level 18 (166–180 cm) and terminated at 210 cm.

Extent and Depth

The terrace is delimited by the meander of Turnover Creek to the east and southeast but continues a few hundred meters north, west, and southwest. Based on the test excavations, buried cultural materials are present in an area approximately 60 m east-west by 30 m north-south. The vertical extent is represented by a distinct lens of cultural materials at 180–205 cm in Test Unit 1 and an intact burned rock feature and associated remains at 165–180 cm in Test Units 2 and 3.

Sediments and Stratigraphy

Backhoe Trenches 1 and 3 are described in detail (see Appendix B), and the profile of Backhoe Trench 2 is similar to that of Backhoe Trench 1. Two alluvial units identified within Backhoe Trenches 1 and 3 are a basal clay to clay loam with one soil imprint identified as the upper West Range fill (Nordt 1992) and an overlying drape of Ford alluvium with a series of

weakly developed soils. The Ford alluvium was most prevalent in Backhoe Trench 1, where it was over 2 m thick near the cutbank of Turnover Creek and thinned to less than 1 m thick away from the channel. This alluvial unit consists mainly of natural levee facies of intercalated sand and mud ripples. Three weakly developed soils (AC-C-2Ab-2Cu-3AC-3C) were identified throughout the Ford alluvium in Backhoe Trench 1. The geometry of the fill suggests that all Ford alluvium was deposited by Turnover Creek after it incised into the underlying upper West Range unit. The top of the upper West Range fill in Backhoe Trench 1 was marked by a paleosol (4Ab horizon) containing a lens of cultural materials. The dark brown to very dark gray clay to clay loam soil is cumulic in nature and is herein called the Leon River paleosol.

The top of the Leon River paleosol was observed in Backhoe Trench 3 at 32 cm, underlying a Ford alluvial unit consisting of intercalated sand and mud ripples and planar beds. The upper West Range/Leon River paleosol (2Ab-2Bk-2Bk2-2Ck profile) observed in the trench profile was approximately 190 cm thick.

Definition of Analysis Units

Based on the presence of different alluvial units and temporally discrete occupations contained therein, three analysis units are defined. Yielding no distinguishable intact cultural deposits, the Ford alluvium corresponds to Analysis Unit 1. Buried in the Leon River paleosol/West Range alluvium, Analysis Units 2 and 3 correlate to separable cultural occupations.

Analysis Unit 1

Analysis Unit 1, the Ford alluvium, was encountered from the surface to depths ranging from only 32 cm in the east end of Backhoe Trench 3 to 218 cm at the south end of Backhoe Trench 1. No cultural materials were observed in these deposits in the backhoe trenches, and the two test units produced only sparse prehistoric remains. Four of the 30 excavated levels (13.3 percent) that sampled the Ford alluvium yielded 11 bones (including 9 snake vertebrae), 4 small burned rocks, 2 flakes, and 3 unmodified mussel shell valves. The cultural remains are so ephemeral that discrete components are impossible to identify or isolate vertically or horizontally.

Analysis Unit 2

Underlying the Ford alluvium, Analysis Unit 2 was encountered at 170–220 cm in Test Unit 1. These upper West Range deposits include a discrete cultural zone buried in the Ab horizon of the Leon River paleosol.

Cultural Materials

At 170–220 cm in Test Unit 1, cultural materials consist of 590 mussel shell valves (34 burned), 101 burned and unburned bones, 17 burned rocks (2 kg), 61 lithic artifacts (1 perforator, 5 scrapers, 1 miscellaneous uniface, 1 core, and 53 pieces of unmodified debitage), 1 modified bone, and 3 modified shells. The modified bone is a large bird bone with a ring-and-snap groove; it was probably being made into an ornament. Three mussel shells exhibit modification; two are cut pieces and one specimen is cut and perforated. Although all five excavated levels produced cultural remains, approximately 98 percent of the assemblage was buried at 180–205 cm. Charcoal collected at 190–200 cm was identified as *Quercus* wood and yielded a radiocarbon age of 780 ± 70 B.P. (see Appendixes A and D). In addition, a flotation sample collected at 190–200 cm contained charred macrobotanical remains including two unidentifiable seed fragments, one *Juniperus* sp. seed, roots/stems of cf. *Yucca* sp., and wood fragments identified as *Platanus* sp. and *Quercus* sp. (see Appendix D). The faunal remains include bones of deer, rabbits, turtles, beaver, birds, and unidentified carnivores (see Appendix C).

Discussion

The calibrated charcoal radiocarbon date of A.D. 1217–1290 reveals that the most intensive occupation was in the Late Prehistoric period (Austin phase). The assemblage is indicative of a suite of cultural activities which include hunting and gathering and lithic procurement/reduction. Utilization of the floral environment for subsistence is represented by the presence of charred yucca roots and a carbonized juniper seed. Wood types consist of sycamore and primarily oak, which represent valuable fuel sources. The faunal assemblage indicates a reliance on a wide variety of vertebrate species and aquatic resources. The relative abundance of

mussel shells indicates intensive utilization of bivalves as a food source, with a few specimens exhibiting intentional modification, most likely for ornamental purposes.

Analysis Unit 3

Also buried in the Leon River paleosol (Ab-Bk horizons within the West Range alluvium), Analysis Unit 3 was encountered in Test Units 2 and 3 at 130 and 166 cm, respectively. This unit extended to the base of the excavations at 210 cm.

Cultural Materials

In Test Units 2 and 3, eight of the nine levels produced cultural items, with most of the assemblage dominated by burned rocks and bones (n = 68). Recovered artifacts consist of 1 scraper, 24 pieces of unmodified debitage, and 1 medium mammal bone with striations indicative of use wear. Vertebrate faunal remains include bones of deer, turtles, rabbits, and pit vipers.

Cultural Features

Feature 1 (a hearth) was encountered at 165–180 cm in the east-central portion of Test Unit 3; it extends into the western edge of Test Unit 2. Contained within the two test units, Feature 1 was ovate and had maximum dimensions of 56 cm east-west by 36 cm north-south (Figure 45). This hearth consisted of a single layer of 26 burned rocks (8 kg) exhibiting little imbrication. Some of the rocks were slightly angled in various directions, and the hearth lacked a basin-shaped cross section. Approximately one-third of the burned rocks were tabular, with the remainder angular. Rock size ranged from 2x2x2 cm to 12x10x5 cm. The feature fill produced one unmodified mussel shell valve and was interspersed with diffuse charcoal. Charcoal from the hearth yielded a radiocarbon age of 1830 ± 60 B.P. (see Appendix A). Although not submitted for macrobotanical analysis, a processed flotation sample contained a low frequency of microdebitage, charred seeds, and carbonized wood. Cultural materials found in the matrix in and surrounding Feature 1 consist of a scraper, 9 flakes, 31 burned rocks (3 kg), 27 bones, and 4 unmodified mussel shell valves (although 1 displays evidence of burning). In Test Units 2 and 3, these specimens comprise approximately 35 percent of the 202 prehistoric items contained in Analysis Unit 3. Although not coincident with a marked increase in cultural materials, the presence of an intact discrete feature is indicative of a living surface.

Discussion

Utilization of the area during the Late Archaic period is indicated by the calibrated charcoal radiocarbon date of A.D. 124–315 (see Appendix A). The faunal assemblage implies use of a wide range of biotic resources. Observed pieces of carbonized wood and seeds from the hearth matrix suggest exploitation of the surrounding flora.

Summary and Conclusions

Testing of 41CV1478 revealed the presence of at least two discrete cultural occupations buried in the Leon River paleosol. The chronometric data indicate that these occupations occurred during the Late Archaic (ca. A.D. 124–315) and Late Prehistoric (ca. A.D. 1217–1290) periods (Analysis Units 3 and 2, respectively). Radiocarbon ages suggest that the cultural deposits are inverted, i.e., a younger date for materials buried at a greater depth nearest Turnover Creek. However, this seeming inversion is due to diachronic occupations occupying various portions of the western valley wall after Turnover Creek incised the upper West Range alluvium and the Leon River paleosol started to form. Although these occupations cannot be correlated stratigraphically without more excavation, the current evidence conclusively shows them to be both vertically and horizontally discrete, with abundant cultural materials and an intact feature. The array of activities represented by the artifacts, feature, and well-preserved organic remains denote intensive use of this area by the prehistoric inhabitants.

41CV1479

Site Setting

Upstream from the confluence of the Leon River and Turnover Creek, 41CV1479 is situated on the north bank of a large meander of Turnover Creek (Figure 46). The terrace, with a moderately sloping to vertical cutbank, has a

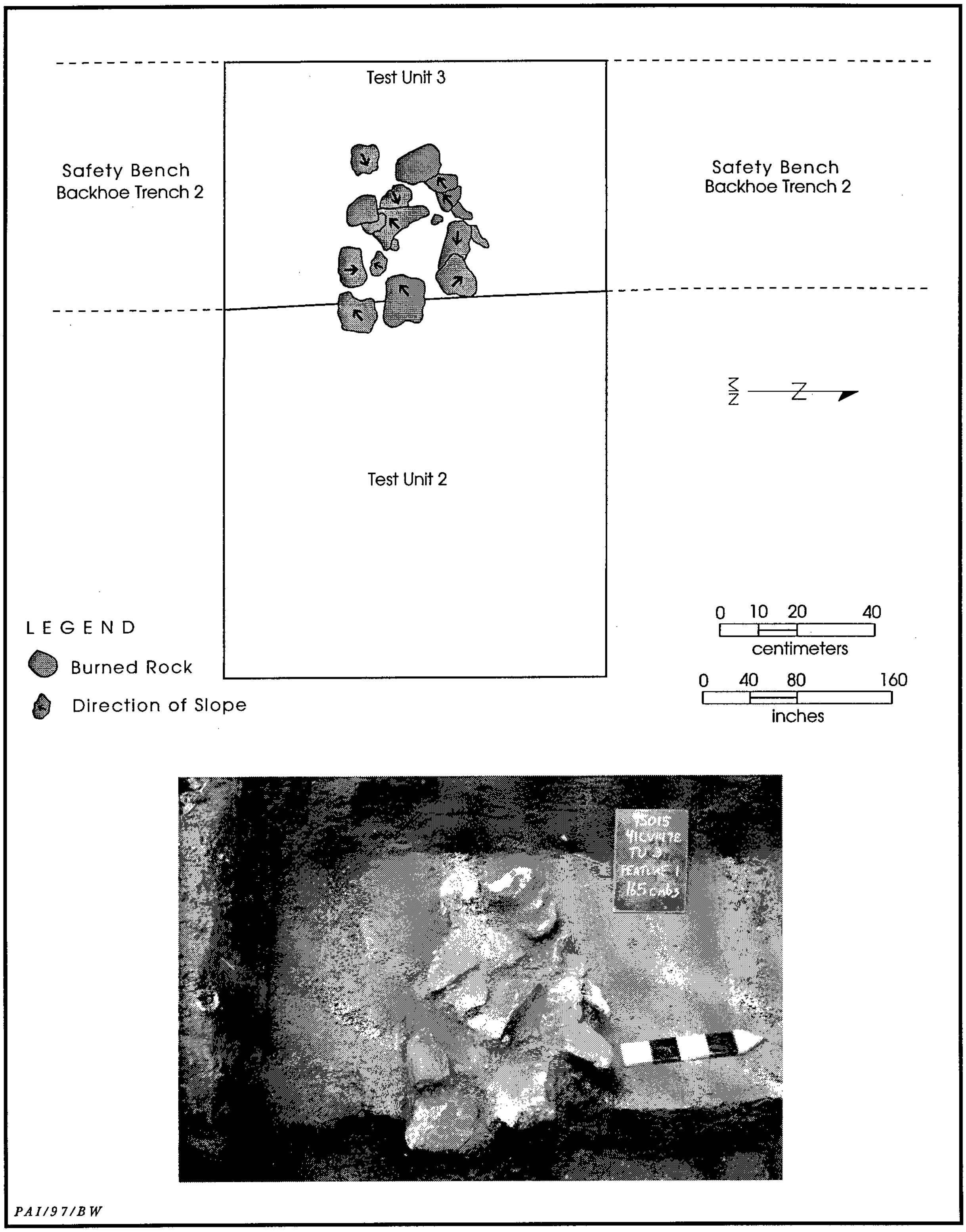

Figure 45. Photograph and plan of Feature 1, 41CV1478. Rocks shown in plan view are at 168–173 cm (bottom elevation) and generally dip toward the center. The photograph shows the feature rocks exposed at 165 cm below surface.

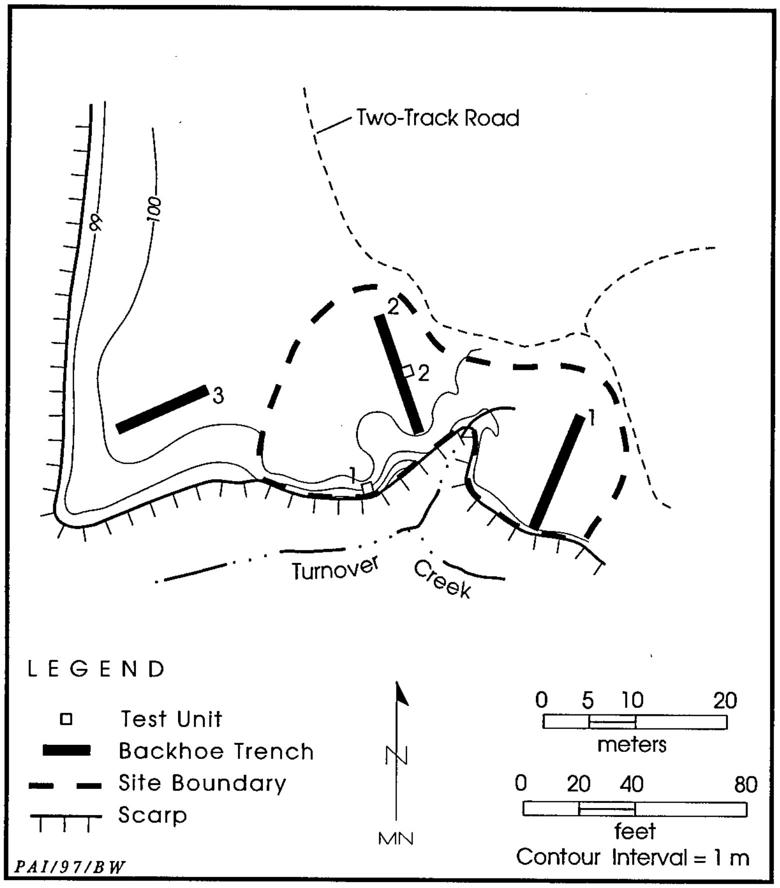

Figure 46. Site map of 41CV1479.

maximum thickness of 3.5 m. Overall visibility along the cutbank is excellent. An erosional gully with maximum dimensions of 8x3x2.5 m is present near the site's center and extends from the edge of the Turnover Creek cutbank to the northeast. Heavily overgrown with grasses and greenbrier, the gully affords poor visibility. This area continues to erode as evidenced by recent slumpage of the gully's banks. An unimproved two-track road parallels the northern and eastern site boundaries, and the area is presently used as pasture. Vegetation consists of an open hardwood forest; however, leaf litter and grasses completely obscure the surface over most of the terrace. Site elevation is 230 m above mean sea level.

Previous Work

The site was recorded on 5 February 1990 by Sanchez, Kleinbach, and Brown (Texas A&M University). Debitage, burned rocks, charcoal, and mussel shells were observed in the cutbank of Turnover Creek at 240–270 cm. Charcoal adjacent to burned rocks at 270 cm was removed as a sample. At the western site margin, intact cultural materials were noted at 40 cm. In addition, a slab-lined hearth 65 cm long and 10 cm thick was exposed at approximately 200 cm in the west wall of an erosional gully. An estimated 60 percent of the site was disturbed by erosion and bioturbation. The site form states that one shovel test was excavated at the western site margin near the edge of the cutbank, but the shovel test is plotted near the eastern boundary on the site sketch map. No cultural materials were recovered, and the depth of the test was not noted. Lastly, the site form reported that Lee Nordt collected a charcoal sample from the cutbank, but the sample's context and depth were not stated. Since the site had potential for containing intact cultural deposits which might make it eligible for NRHP listing, additional testing was recommended (Carlson et al. 1994:73).

Work Performed

Formal testing was completed in July 1995. Prior to excavation, the Turnover Creek cutbank and erosional gully were reinspected. None of the cultural materials or features observed by previous investigators were rediscovered. However, a rock-filled depression (designated Feature 1) was visible in the cutbank profile (Figure 47) at approximately 138–278 cm below the surface. Test excavations at the site included three backhoe trenches and two test units. A total of 5.1 m^3 was manually excavated.

Near the eastern site margin, Backhoe Trench 1 was placed 10 m east of the erosional gully and perpendicular to Turnover Creek. The

Figure 47. Feature 1, 41CV1479. (*a*) Area overview with feature exposed in the cutbank and Test Unit 1 near the center; (*b*) close-up of feature exposed in the cutbank with Test Unit 1 excavation in progress. Both views are north.

trench measured 15x1.5x3.9 m and was oriented to 28°. A few mussel shells and charcoal smears were observed at various depths, and the water table was encountered at the base of the trench. Excavated 20 m northwest of Backhoe Trench 1, Backhoe Trench 2 was placed just north of the cutbank edge and west of the erosional gully. Oriented to 342°, the trench had dimensions of 14x1.5x3.75 m. In the east wall at approximately 180–200 cm, a lens of cultural materials containing bones, flakes, charcoal, and mussel shells dipped gently southward toward the creek. Ten meters north of the cutbank edge and ca. 25 m west of Backhoe Trench 2, Backhoe Trench 3 (measuring 11x1.5x3.3 m and oriented to 48°) was excavated. No cultural materials were observed in this trench.

Excavated to 270 cm, Test Unit 1 was located 5 m west of the erosional gully and 6 m southwest of Backhoe Trench 2. It was placed along the creek cutbank to bisect Feature 1. The unit was oriented to 343° and initially measured 1x1 m. Due to the cutbank gradient, the north-south dimension gradually enlarged with depth to a maximum of 140 cm. Test Unit 2 (1x1 m), excavated to 240 cm, was placed above the cultural lens exposed in the east wall of Backhoe Trench 2.

Extent and Depth

The landform is delimited by Turnover Creek to the south and west but extends hundreds of meters to the north and east. Near the western limits of the terrace, the apparent absence of cultural materials in Backhoe Trench 3 suggests that the site does not continue in this direction. Thus, test excavations indicate that the site measures approximately 40 m east-west by 24 m north-south. Subsurface prehistoric occupations are represented by Feature 1 and associated cultural remains at 160–220 cm in Test Unit 1 and a lens of prehistoric materials at 180–220 cm in Test Unit 2.

Sediments and Stratigraphy

The profile of Backhoe Trench 1 is very similar to those of Backhoe Trenches 2 and 3, which are described in detail in Appendix B. The profile of Backhoe Trench 2 reveals 172 cm of Ford alluvium (C-C2-2AC-2C-3Bwb) overlying 158+ cm of upper West Range fill (4Ab-4Bwb-4C). The previously mentioned lens of cultural materials is within the Leon River paleosol (4Ab-4Bwb soil horizons), which caps the West Range alluvial unit. The profile of Backhoe Trench 3 is similar but reveals 171 cm of Ford alluvium (A-Bw-C) overlying 149+ cm of upper West Range fill (2Ab-2ABwb-2C). In the profiles of Backhoe Trenches 2 and 3, the Ford alluvial unit is comprised of natural levee facies of intercalated muds and sands immediately above the upper West Range fill, which is capped by the Leon River paleosol.

Definition of Analysis Units

Based on the presence of different alluvial units, two analysis units are identified. Analysis Unit 1 corresponds to the Ford alluvium, and Analysis Unit 2 is defined as the West Range alluvium/Leon River paleosol. All of the test excavations sampled both analysis units.

Analysis Unit 1

Analysis Unit 1 was generally encountered from the surface to 170 cm in all backhoe trenches and test units, although it was present only from 0–130 cm in Test Unit 1 due to beveling along the cutbank edge. Although no cultural remains were observed in the backhoe trenches, Test Units 1 and 2 produced moderate amounts of prehistoric materials. Nine of 34 excavated levels (26.5 percent) produced 32 bones, 8 small burned rocks, 6 flakes, 1 miscellaneous biface, and 19 unmodified mussel shell valves. Most (65–70 percent) of the cultural materials were recovered in the lower part of the Ford alluvium at its contact with the culturally significant Leon River paleosol (see Analysis Unit 2). It is unclear whether these materials represent a separate cultural zone or are associated with the stratigraphically discrete occupations encountered directly below the contact. Based on the testing results, Analysis Unit 1 does not contain discrete occupations that can be separated with any degree of confidence either horizontally or vertically.

Analysis Unit 2

Analysis Unit 2 underlies the Ford alluvium at ca. 170 cm and extends to at least 390 cm (maximum depth of Backhoe Trench 1). Within the Ab and Bwb horizons of the Leon River

paleosol, Backhoe Trenches 1 and 2 exposed cultural materials, and Test Units 1 and 2 contained vertically discrete cultural zones.

Cultural Materials

In Test Unit 1, cultural materials consisted of 7 pieces of debitage, 12 small burned rocks (0.5 kg), 8 burned mussel shell valves, 50 unmodified mussel valves, and 35 bones. Of the 112 prehistoric items, about 73 percent (most notably mussel shells) occurred at 170–220 cm. This concentration of cultural materials coincides with the living surface of Feature 1, i.e. the level from which the feature is intrusive.

The sediments below 170 cm in Test Unit 2 yielded the following materials: 25 small burned rocks (3 kg), 18 pieces of debitage, 58 unmodified mussel shell valves, 5 burned mussel valves, 234 unmodified bones, 1 deer ulna awl, 1 scraper, 1 untyped arrow point, and 1 Scallorn point. A discrete cultural layer at ca. 180–220 cm contained most of these materials (all but eight of the unmodified mussel shell valves). Ash pockets, diffuse burned clay, and scattered charcoal were primarily confined to the northeast quadrant of the unit at 190–200 cm. A flotation sample collected from an ash anomaly at 200–203 cm yielded charred macrobotanical remains identified as fragments of *Quercus* wood, three *Carya* sp. nut fragments, one *Juniperus* sp. seed, Asteraceae hulls, Cyperaceae seeds, and Poaceae seeds (see Appendix D). The remains of oak and sedge comprise 65.7 percent of the floral assemblage. Charcoal collected at 190–200 cm yielded a radiocarbon age of 940 ± 60 B.P. (see Appendix A).

Cultural Features

Feature 1, the only feature encountered at 41CV1479, was exposed in the cutbank of Turnover Creek (see Figure 47). The cutbank exposure indicated that Feature 1 was approximately 75 cm thick. However, the test excavation revealed a thickness of 119 cm. The feature is an intrusive rock-filled depression that extended from an old living surface somewhere between 130 and 160 cm (at the top of the Analysis Unit 2 deposits) down to a maximum depth of 249 cm; an estimated 50 percent of the existing feature was contained in Test Unit 1, primarily in the southeast quadrant. The cutbank exposed a portion of the feature from 130 to 200 cm.

Since Feature 1 was relatively thick (119 cm), the excavation method employed consisted of peeling off each rock layer. Initially, a rock layer was exposed and the feature's perimeter defined by the outermost edges of the rocks. Next, the rock layer was recorded and removed. Then, flotation and charcoal samples were collected from the feature matrix, with the remaining sediment screened through ¼-inch-mesh hardware cloth.

The process was repeated, layer by layer, until the feature was completely excavated. Encountered at 130 cm, the first rock layer extended to 150 cm and measured 63x43 cm. Eight unburned limestone slabs (53 kg) ranged in size from 10x10x2 cm to 38x24x5 cm and were on angle (about 45°) from east to west. The average difference in elevation from the east edge of a rock to its west edge was 7.5 cm, with a few being vertical. No cultural materials were encountered, but an area of diffuse charcoal (45x35 cm) was encountered in the northeast corner of the unit at 145–150 cm.

The second rock layer (at 150–160 cm) measured 42x62 cm and consisted of three unburned slabs (28 kg). The largest slab measured 44x20x5 cm, with the rocks again on angle, sloping from east to west. No artifacts were encountered. Paralleling the northern edge of the feature, a large root extended from west to east across the entire unit.

At 160–175 cm, Feature 1 (70x75 cm) consisted of 1 large slab (12.5 kg), 12 tabular pieces of limestone (15.5 kg), and 3 cobbles (2 kg). The slab measured 30x25x5 cm, the cobbles were fist sized, and the remaining pieces averaged 12x8x3 cm. Most rocks sloped gently north to south toward the cutbank and what would have been the center of the feature. None of the rocks were burned, but several small limestone heat spalls (less than 0.5 kg) were noted. Cultural materials consisted of five unmodified mussel shell valves, six bone fragments, and one flake. In addition, an amorphous ash stain (18x13 cm) was encountered in the northwest quadrant of the unit at 163–170 cm. Also recorded in plan view were the edges of five immovable unburned rocks that extended into the east wall profile. These rocks were confined to a 28x6-cm area, but with depth some rocks became larger and additional ones were exposed. At 224 cm, 11 immovable unburned rocks were confined to a 52x20-cm area along the east wall. These are

not included under the remaining discussion of rock layers.

At 175–198 cm, five medium-sized, unburned tabular rocks (16.5 kg) and one fist-sized, angular burned rock (2.4 kg) were contained in an area 76 cm in diameter. Half of the rocks dipped north to south toward the cutbank and the remainder lay horizontal. The matrix produced six unmodified mussel shell valves.

Eleven unburned rocks (34 kg) and one small angular burned rock (0.25 kg) comprised Feature 1 (90x52 cm) at 198–210 cm. The unburned rocks consisted of nine tabular fist-sized and larger pieces, one slab measuring 40x25x8 cm, and one medium-sized rounded cobble. Half of the rocks sloped toward the cutbank. Collected from 210 cm in the feature matrix, a charcoal sample yielded a radiocarbon age of 870 ± 60 B.P. (see Appendix A).

At 210–224 cm, the feature was constructed of one slab (measuring 32x32x5 cm), seven tabular rocks (averaging 10x10x3 cm), and two fist-sized angular rocks. Confined to an 86x65-cm area, all of the rocks (n = 10, 34 kg) were unburned, with 70 percent laid horizontal. One unmodified mussel shell valve was contained in the fill. At 216–220 cm, a long linear segment of ashy matrix was present across the test unit. Extending from the northwest corner of the unit, it paralleled the northern edge of Feature 1 and continued into the east wall. A 16x16-cm section of this segment abutting the northern feature boundary contained fragments of burned clay. This area probably represents an ash-filled rodent burrow.

Four large slabs and four medium-sized tabular rocks (n = 8, 35 kg) comprised the feature at 224–232 cm. The rocks were unburned, and all but one upright piece lay horizontal. The area encompassed by the feature measured 53x66 cm and contained two unmodified mussel shell valves, one burned valve, and three bones (one identified as deer). Although not submitted for macrobotanical analysis, a processed flotation sample collected at 230 cm contained at least one charred seed and a few pieces of carbonized wood.

At 232–241 cm, eight medium-sized tabular rocks and three large slabs (n = 11, 40 kg) were contained in a 40x62-cm area, a few sloping gradually south to north. None of the rocks exhibited burning, and no cultural materials were present in the matrix.

The last rock layer, with dimensions of 38x67 cm, was encountered at 241–249 cm. This layer consisted of seven medium-sized tabular and five angular unburned rocks (n = 12, 7 kg), with all but three rocks laid horizontally (Figure 48). The fill yielded one small burned rock (0.25 kg) and one unmodified mussel shell valve.

In summary, Feature 1 is a spatially discrete rock-filled depression. It consisted of nine rock layers comprised of 84 unburned rocks and three burned rocks. Primarily composed of slabs and tabular pieces (86.9 percent), the rest of the feature consisted of angular rocks and cobbles. These manuports may have filled a natural depression or gully since no evidence of an intentionally excavated, tapering pit was apparent. Although the total amount of cultural materials recovered from the feature fill was low (n = 25), 72 percent of these remains occurred at 160–210 cm which coincides with the top of the Leon River paleosol. This corresponds to a peak in artifact frequencies at 170–220 cm from the cultural zone surrounding the feature and stratigraphically overlaps the buried occupation in Test Unit 2.

Discussion

Analysis Unit 2 consists of a prehistoric occupation within the Ab and Bwb horizons of the Leon River paleosol. Based on calibrated charcoal radiocarbon dates of A.D. 1052–1248 for Feature 1 and A.D. 1022–1177 for an occupation zone containing a Scallorn and untyped arrow point, the cultural deposits may be temporally assigned to the Late Prehistoric period, Austin phase.

The first two rock layers of Feature 1, at 130–160 cm, generally sloped radically from east to west (the direction of flow of Turnover Creek); rocks in the lower seven layers were either horizontal or sloped gently north to south toward what might have been the feature's center. Thus, the bulk of Feature 1 (which appears intact) intruded into the Leon River paleosol, with rocks possibly being mounded above the old ground surface at 130–160 cm subsequently toppled and buried by younger (Ford) deposits. The overlapping concentrations of cultural materials in feature and nonfeature contexts appear to represent the living surface from which Feature 1 was excavated, approximating the top of the paleosol at 160–170 cm and continuing to 220 cm. These

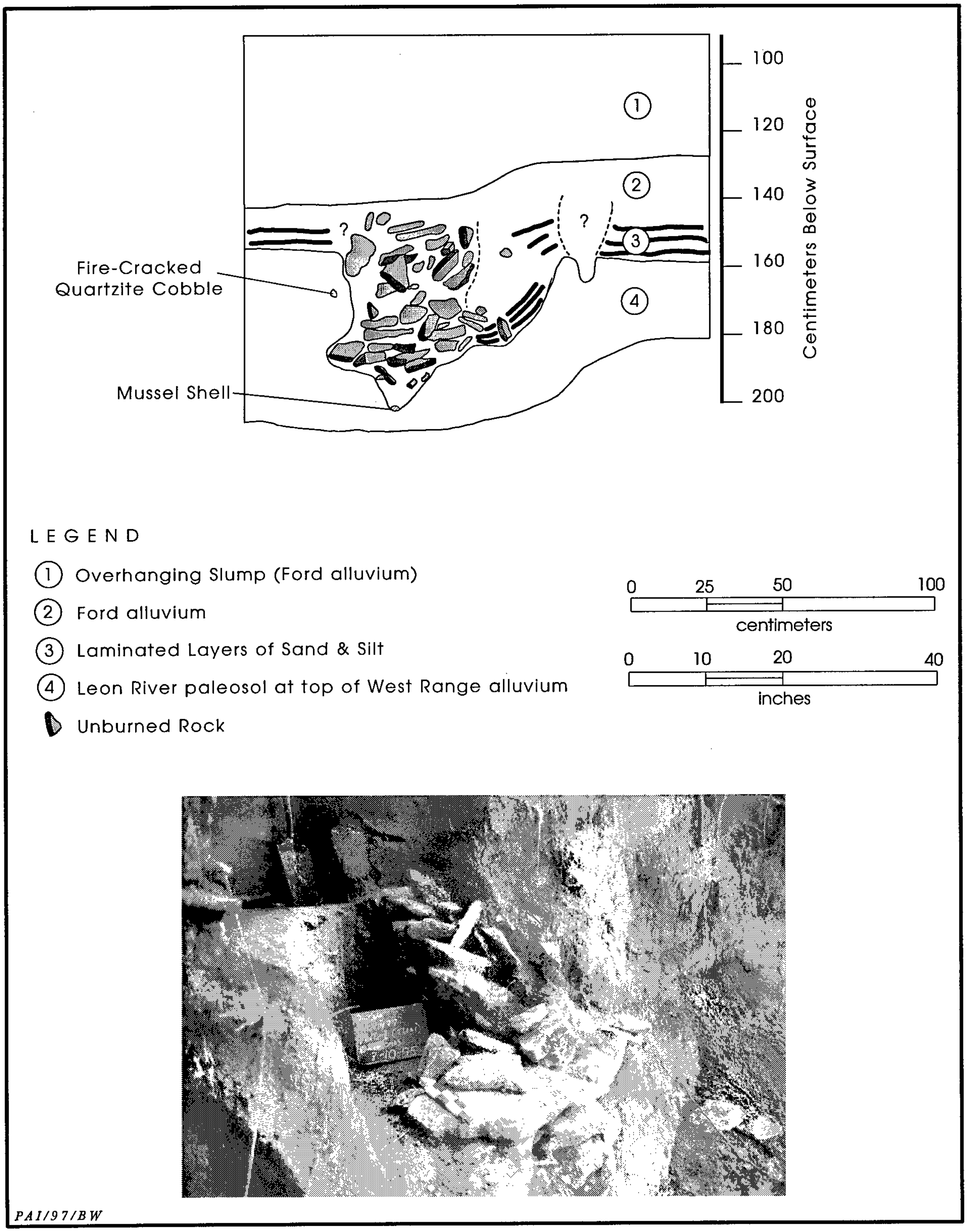

Figure 48. Photograph and profile of Feature 1 in Test Unit 1, 41CV1479. Photograph shows feature rocks exposed to 244 cm; view is east.

concentrations seem to correlate with the uppermost materials in the cultural occupation at 180–220 cm in Test Unit 2.

Based on this evidence, the following scenario is hypothesized. More or less continuous occupations occurred at 41CV1479 throughout the time that the upper meter of West Range sediments was deposited. Occupations continued during the time that the terrace stabilized and the Leon River paleosol was forming. Near the end of the West Range deposition sequence, Feature 1 was deposited by human activity in a pit (either a natural gully or intentionally excavated pit). The site was virtually abandoned or occupied/utilized ephemerally during the time that the Ford sediments were being deposited. While it appears that the uppermost Feature 1 rocks extended above the terrace surface and were subsequently buried by Ford sediments, it is possible that some of the uppermost West Range sediments were washed away just prior to the start of the Ford depositional sequence (i.e., the terrace edge was beveled by erosion to expose the upper portion of Feature 1).

The function of Feature 1 remains ambiguous. Upon first encountering the feature, its overall morphology (particularly its thickness and abundance of unburned rocks) was reminiscent of a burial cairn. However, the absence of human remains in the test excavation precludes this interpretation. Cultural materials overwhelmingly consist of unmodified mussel shell valves, but this is not a likely candidate for a food processing feature. This feature may represent a gully that was filled for erosion control, a stockpile of rocks for later use, a backfilled storage pit, or a support/stabilization for some sort of structure. To date, no other comparable feature is known at Fort Hood.

A suite of cultural activities is evident in the occupation zone due to the array of cultural materials associated with lithic technology and food procurement/processing. The variety of faunal and floral remains is indicative of intensive hunting and gathering. Mussel shells; bones of deer, rabbits, and turtles; hickory nut fragments; sunflower seed hulls; and seeds of juniper, grass, and sedge reveal the exploitation of a diverse biotic regime. Cultural debris (i.e., burned rock) indicative of the cleaning out and reusing of cooking features are also present. Based on the foregoing, Analysis Unit 2 at 41CV1479 represents a discrete cultural occupation that has the potential to yield substantial and significant information pertaining to the Austin phase.

41CV1480

Site Setting

Situated on a T_0/T_1 complex, 41CV1480 is located on the east bank of the Leon River upstream from its confluence with Turnover Creek and a large meander in the channel (Figure 49). Vertical to moderately sloping, the Leon River cutbank is approximately 5 m high. The upper meter of deposits along the cutbank is obscured by cascading poison ivy vines, particularly in the southern half of the site. At the southern site margin, an old barbed wire fence extends from the edge of the cutbank approximately 10 m northeast across the terrace. A small rise approximately 20 m in diameter is present near the site center. Vegetation consists of large bur oak, mulberry, and hackberry trees, with the ground surface completely obscured by grasses, greenbrier, leaf litter, and poison ivy. The area is presently used as pastures, and the primary disturbance is cutbank erosion. Site elevation is 220 m above mean sea level.

Previous Work

Cargill, Sandefur, and Vandersteen (Texas A&M University) recorded the site on 5 February 1990. In the cutbank of the Leon River, a cultural lens measuring 300 cm long and 15 cm thick was exposed approximately 150 cm below the surface. Cultural materials within this lens included burned rocks, mussel shells, and charcoal. A recent campfire was noted on the surface, and an estimated 60 percent of the area had been impacted by erosion and recent activity. At the time of recording, the site was considered too deep to shovel test. Since the site potentially contained intact cultural deposits which might be eligible for NRHP listing, further testing was recommended (Carlson et al. 1994:73–74).

Work Performed

Formal testing of 41CV1480 was completed in July 1995. Prior to excavation, the Leon River cutbank was reinspected. Two basin-shaped unlined hearths were exposed at approximately the same depth (150 cm) as the cultural lens

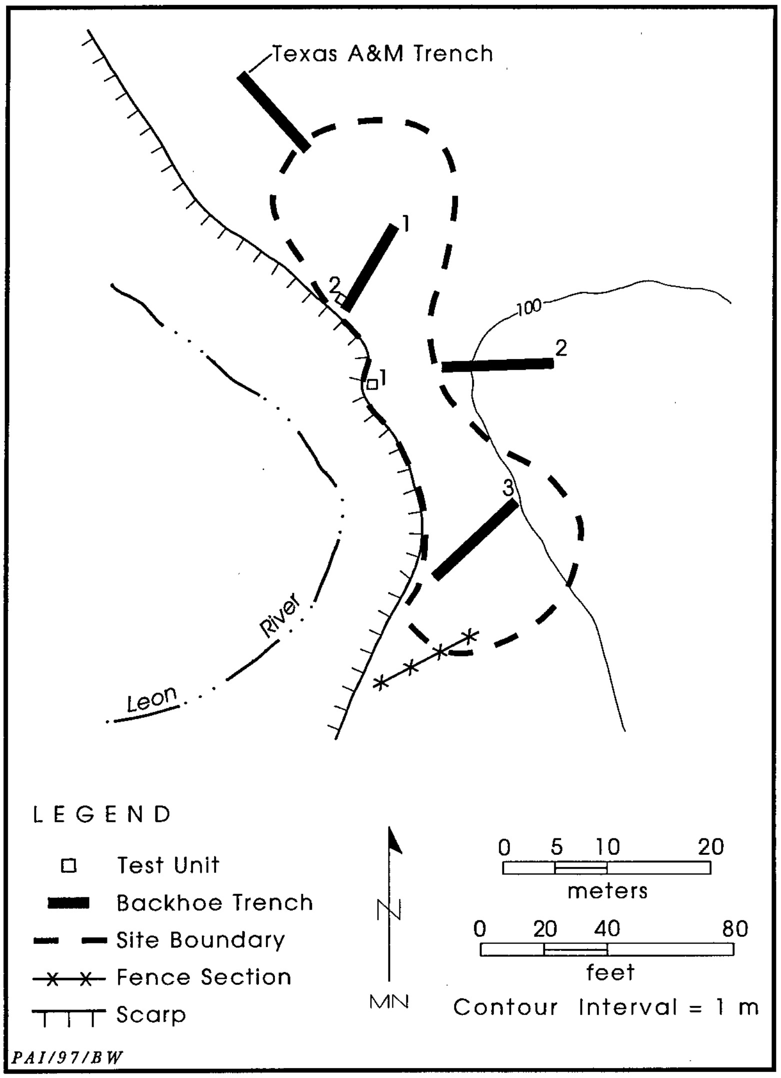

Figure 49. Site map of 41CV1480.

recorded by the previous investigators. In addition, a 10-cm-thick lens of mussel shells was observed at approximately 200 cm. Test excavations included three backhoe trenches and two test units. A total of 4.6 m³ was manually excavated.

Perpendicular to the Leon River, Backhoe Trench 1 was excavated above the mussel shell lens. Oriented to 37°, the trench measured 10x1.5x3 m, with the shell lens exposed in a section of the west wall nearest the cutbank. Backhoe Trench 2 was oriented to 270° and had dimensions of 12x1.5x3.7 m. Placed 12 m south of Backhoe Trench 1 and 10 m east of the cutbank, Backhoe Trench 2 was due east of the two hearth features visible in the cutbank. No cultural materials were observed in the trench. Backhoe Trench 3, oriented to 45°, was excavated 15 m south of Backhoe Trench 2 and just north of the barbed wire fence at the southern site margin. The trench measured 10x1.5x3.3 m, with common pieces of charcoal and burned rocks occurring at 114–177 cm.

Excavated to 190 cm, Test Unit 1 was placed along the edge of the cutbank above the two exposed features. The unit was perpendicular to the cutbank (oriented to 330°) and bisected both features. Initially measuring 1x1 m, the east-west axis of the test unit increased with depth due to the slope of the cutbank. The maximum east-west dimension of 150 cm occurred at 160–190 cm. Placed along the west wall of Backhoe Trench 1 above the exposed mussel shell lens, Test Unit 2 measured 1x1 m and was excavated to 270 cm (Figure 50). Since minimal cultural materials were encountered from the surface to 130 cm in Test Unit 1 and various trench and cutbank exposures revealed no cultural remains in these upper deposits, the upper 130 cm of Test Unit 2 was removed and not screened. The shell lens was contained within a sandy clay loam first encountered at 219 cm along the south wall of the test unit. In contrast, the surrounding matrix consisted of fine-to-medium-grained sands. The contact between these two fills was abrupt, with the matrix containing the shells accounting for 10 percent of the test unit's fill. The sandy clay loam expanded to the north with depth and at 263 cm comprised 85 percent of the test unit. Excavation of the sands continued in arbitrary 10-cm levels, with the mussel shell lens excavated according to its natural slope.

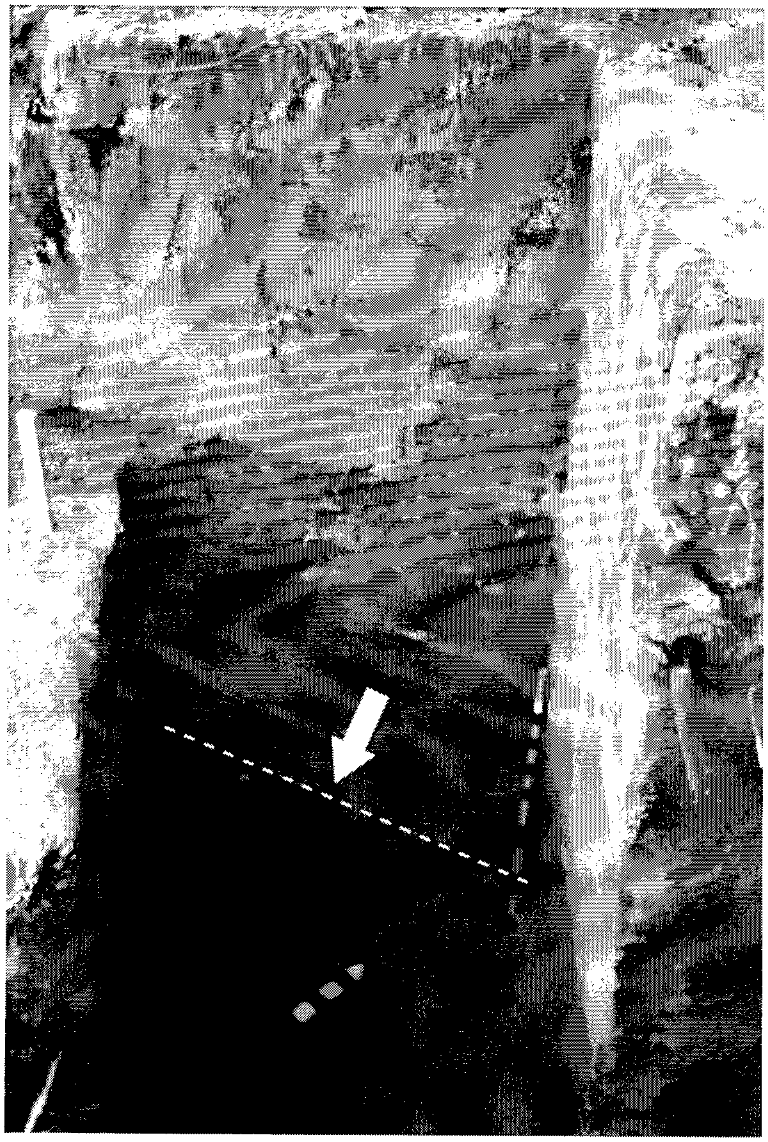

Figure 50. West wall profile of Test Unit 2, 41CV1480. Profile extends from surface to 270 cm; arrow and dashed line indicate the approximate location of Feature 3.

Extent and Depth

The Leon River forms the western site boundary, with a meander in the channel bordering the terrace 35–40 m north of the site. Turnover Creek and its confluence with the Leon River delimit the landform within a hundred meters to the east and northeast, respectively. The terrace, however, continues hundreds of meters to the south. Based on the results of formal testing and the limits of exposed cultural materials in the cutbank, the horizontal site extent is somewhat arbitrarily defined as 50 m northwest-southeast and 15 m northeast-southwest.

Stratigraphically discrete cultural occupation zones are present in Test Units 1 and 2, with sparse (if any) cultural materials above or below these levels. Two unlined basin-shaped hearths and a concurrent increase in cultural materials at 150–180 cm provide evidence of a buried occupation in Test Unit 1. In Test Unit 2, the cultural zone consists of the 10-cm-thick mussel shell lens and associated artifacts at ca. 219–263 cm.

Sediments and Stratigraphy

Backhoe Trenches 1 and 2 exhibited similar profiles, but Backhoe Trenches 2 and 3 are described in detail (see Appendix B). The profile of Backhoe Trench 2 revealed over 3 m of Ford alluvial fill imprinted with three soils (A-C-C2-2Ab-3Ab-3Bwb-3BC). Backhoe Trench 3 revealed a 114-cm-thick Ford alluvial drape (A-Bw-C-2AC) overlying an upper West Range deposit capped by the Leon River paleosol (3Ab-3Bwb-3C). Together, the backhoe trenches represent a series of progressively more recent, laterally accreted Ford deposits composed of intercalated to massive (dark brown to yellowish brown sandy loam and clay loam) point bar facies and (dark gray to very dark grayish brown clay loam) overbank facies that are erosionally inset into or laterally adjacent and lapping onto older upper West Range deposits.

Cultural Materials

In Test Unit 1, sparse cultural materials (one

flake and two bones) were contained in the deposit above the main prehistoric occupation zone (ca. 15–180 cm) and only four unmodified mussel shell valves were recovered below. At 150–180 cm, the matrix in and surrounding Features 1 and 2 produced 28 bones, 68 small angular burned rocks (5 kg), 53 unmodified mussel shell valves, and 4 burned mussel valves. Approximately 90 percent of these remains occurred in the western half of the unit. The only cultural remains encountered in Test Unit 2 were associated with Feature 3 at 219–263 cm. Cultural materials associated with Feature 3 are described below.

Cultural Features

Occurring at approximately the same elevation, two circular basin-shaped hearths are part of a cultural occupation buried in Test Unit 1. Encountered at 160–180 cm, Feature 1 was confined to the southwestern edge of the test unit. Maximum excavated dimensions were 55 cm east-west and 35 cm north-south; however, the cutbank profile indicates that the feature extends at least 40 cm south beyond the limits of the test unit (Figure 51). Based on the foregoing, the hearth is estimated to be 80 cm in diameter, with the western half removed by erosion. The feature matrix contained abundant charcoal and four angular burned rocks (1 kg), with a 2-cm-thick rind of oxidized sediment lining the base of the hearth. Wood charcoal identified as *Acer* yielded a radiocarbon age of 420 ± 70 B.P. (see Appendixes A and D). Additional charred macrobotanical remains consist of 10 indeterminable seeds and at least 7 grams of cf. *Yucca* sp. root (see Appendix D). Other remains from the feature fill include one unmodified mussel shell valve and one flake.

About 25 cm north of Feature 1, Feature 2 was encountered at 160–173 cm and was restricted to the northwestern corner of the test unit. The excavated portion of the hearth measured 42 cm north-south and 22 cm east-west. In the cutbank profile, the feature extends at

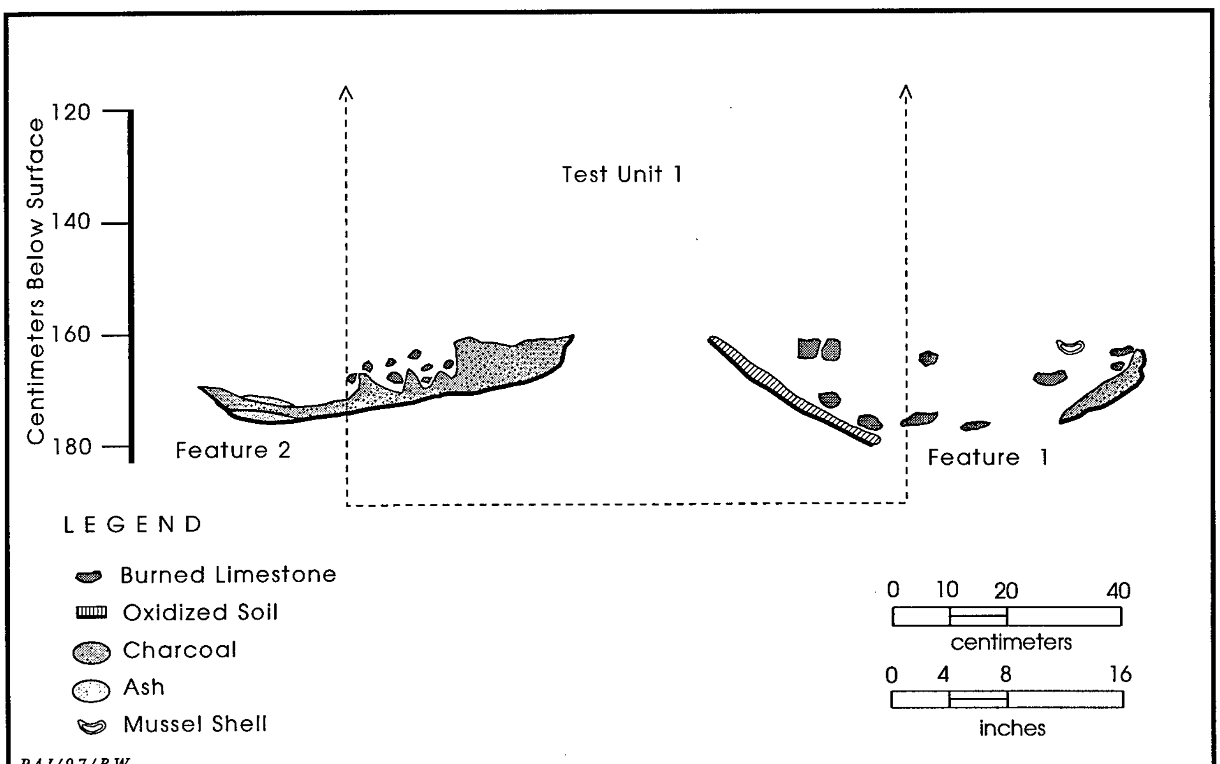

Figure 51. Profile of a section of the Leon River cutbank from 120–190 cm showing locations of Test Unit 1 and Features 1 and 2, 41CV1480.

least 26 cm north beyond the test unit's north wall (see Figure 51). Based on the excavation results and cutbank exposure, Feature 2 is estimated to have been ca. 75 cm in diameter. It appears that the western two-thirds of the hearth was removed by erosion. The feature fill consisted of scattered charcoal and ash among two layers of medium-sized, angular, blocky burned rocks (n = 17, 3 kg). Charred macrobotanical remains recovered from flotation of hearth fill were identified as *Celtis* sp. nutlets, woody legume, Rosaceae wood, and *Diospyros virginiana* wood, the latter comprising the majority of the assemblage (see Appendix D).

At 219–263 cm in Test Unit 2, a buried cultural lens (Feature 3) consisted of 48 unmodified mussel shell valves, sparse charcoal, and four bones. Although not submitted for macrobotanical analysis, a processed flotation sample collected at 219–257 cm did produce at least one charred seed and a small amount of carbonized wood. Based on the exposures afforded by Test Unit 2, Backhoe Trench 1, and the adjacent Leon River cutbank, the minimum dimensions of Feature 3 are conservatively estimated to be 6 m northwest-southeast by 3 m northeast-southwest and not greater than 10 cm thick. The difference in elevation is not indicative of the thickness of the lens, but rather its natural slope. From southwest to northeast, for every 20 cm excavated horizontally, the lens dipped 10 cm vertically. The deposit (sandy clay loam) containing the lens was surrounded by mottled sands which produced no cultural materials.

Discussion

The testing results indicate the presence of two stratigraphically discrete cultural occupation levels in primary geomorphic contexts. While no temporally diagnostic artifacts were recovered, a calibrated radiocarbon date of A.D. 1433–1621 for Feature 1 indicates that the upper occupation zone falls into the Late Prehistoric period (Toyah phase). The similar construction and spatial relationship of Features 1 and 2 suggest that they are contemporaneous. The substantial quantity of faunal and floral remains demonstrate that both of these unlined hearths probably functioned as cooking pits. Faunal remains suggest a significant reliance on the collection of mollusks and harvesting of aquatic animals (i.e., turtles). Macrobotanical remains include hackberry seeds and yucca root that may represent food resources, in addition to wood of persimmon, hawthorn or crabapple, and mesquite or honey locust. The types and variety of woods represented in this Toyah phase occupation are quite different from the remains (oak and sycamore) identified in Austin phase components at other sites (41CV1478 and 41CV1479) in the Leon River drainage basin.

The lower occupation zone evident in Test Unit 2 manifests primarily as a mussel shell lens. Although it lacks a chronological assessment, this lower zone is buried within an alluvial unit (Ford) that stratigraphically correlates to the Late Prehistoric period (Nordt 1992:73) and may date to the same approximate time (i.e., Toyah phase) as the upper occupation. The geometry of the deposits in Test Unit 2 suggests that the prehistoric occupants made use of an accreting point bar environment.

Although not formally tested by manual excavation units, scattered burned rocks and charcoal were observed in the Leon River paleosol (114–177 cm), encountered only in Backhoe Trench 3. As evidenced at other sites (41CV1478, 41CV1479, and 41CV1482) in the Leon River complex, this paleosol is typically a culturally significant stratigraphic marker.

In conclusion, the test excavations demonstrate that two stratigraphically discrete Toyah phase occupations are buried within the Ford alluvium. Because this alluvial unit overlies the Leon River paleosol, which has been demonstrated to be culturally relevant at other sites in the Leon River valley, 41CV1480 has the potential to contain earlier components in primary context. If earlier components exist at this site, however, they are likely to be deeply buried.

41CV1482

Site Setting

Site 41CV1482 is situated on a level terrace (T_1) wedged between the Leon River channel on the west and an unnamed intermittent tributary on the south (Figure 52). The 5-m-thick Leon River cutbank is steep to vertical in the vicinity of the site. The gradient of the 3-m-thick tributary cutbank is steep to moderate. The visibility along the tributary is extremely poor due to tall

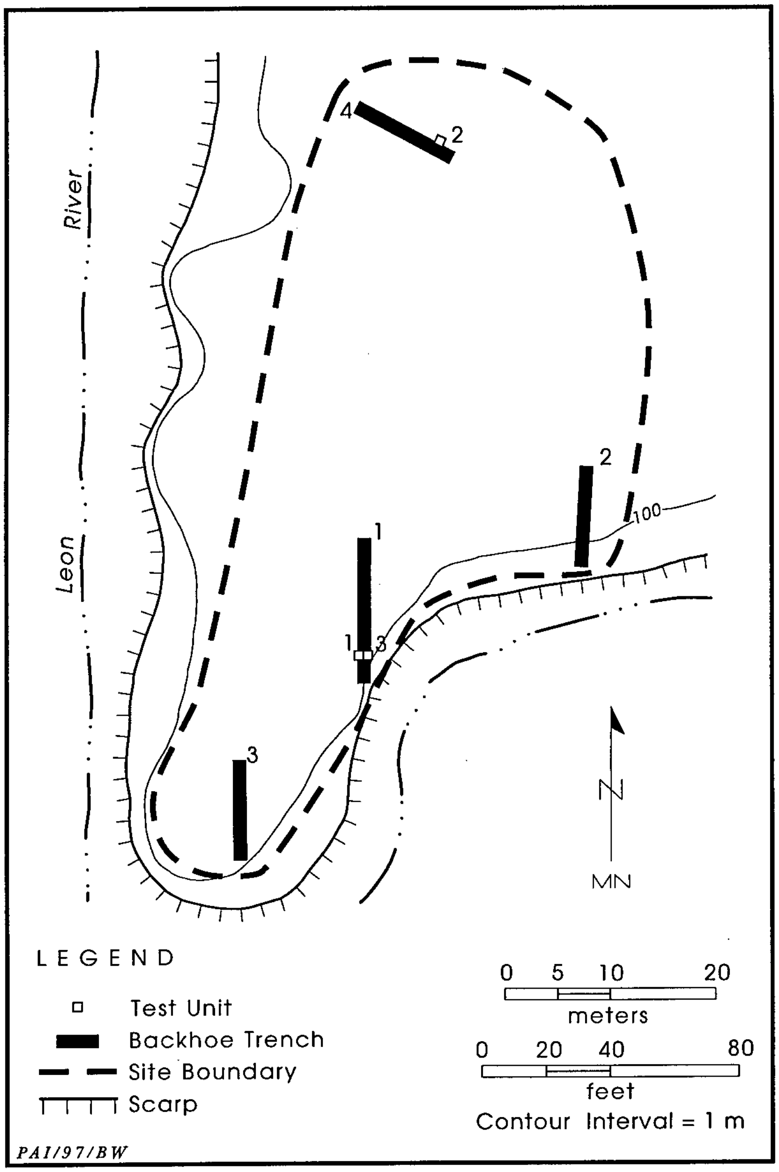

Figure 52. Site map of 41CV1482.

grasses, greenbrier, and recent overbank deposition. Vegetation across the terrace consists of a mixed hardwood forest including pecan, oak, and hackberry trees. Grasses and leaf litter cover the surface and visibility is extremely poor. The only visible impact to the site is cutbank erosion. Site elevation is 220 m above mean sea level.

Previous Work

Brown, Kleinbach, Cargill, Vandersteen, Sandefur, and Sanchez (Texas A&M University) recorded the site on 5 February 1990. Cultural deposits consisting of mussel shells, burned rocks, and lithics were exposed in the tributary cutbank at approximately 100 cm below the surface. The artifacts appeared to extend to a depth of 250 cm. One Scallorn point and a piece of ground stone were collected. An estimated 40 percent of the site had been impacted by erosion. One shovel test was excavated to 75 cm near the tributary cutbank at the south-central site margin. No cultural materials were recovered from the surface to 60 cm. However, moderate amounts of mussel shells and burned rocks were noted at 60–75 cm. Since the site had the potential for intact buried deposits which might be eligible for NRHP listing, further testing was recommended (Carlson et al. 1994:74).

Work Performed

Formal testing of 41CV1482 was completed in July 1995. Neither cutbank was reinspected due to poor visibility along the tributary and inaccessibility of the vertical cutbank along the Leon River. The test excavations included four double-wide backhoe trenches with safety benches and three test units. A total of 4 m^3 was manually excavated.

Backhoe Trench 1 was placed a few meters from the edge of the tributary cutbank. Oriented to magnetic north, the trench had dimensions of 12.5x1.5x3 m. A burned rock concentration was exposed at ca. 100 cm near the southern end of the trench, and the western safety bench was dug down to just above the feature (Feature 1). Backhoe Trench 2 was placed 20–25 m east (upstream) of Backhoe Trench 1; it measured 8x1.5x2.6 m and was oriented to 350°. A

burned rock feature was encountered at approximately 100 cm in the southern end of the trench. Backhoe Trench 3, oriented to magnetic north, was placed 15–20 m southwest (downstream) of Backhoe Trench 1. The trench measured 9x1.5x2.5 m, with a diffuse lens of burned rocks observed at 110–120 cm near the southern end of the trench. Excavated about 25 m north of Backhoe Trench 1, Backhoe Trench 4 measured 9x1.5x2.8 m and was oriented to 310°. Cultural materials (i.e., burned rocks, mussel shells, and charcoal) were exposed at two or three levels in the trench.

Excavated to 150 cm, Test Unit 1 was placed along the west wall of Backhoe Trench 1 above the burned rock feature (Feature 1). Placed along the east wall of Backhoe Trench 4 above the exposed cultural lenses (one of which was defined as Feature 4), Test Unit 2 was excavated to 200 cm. These two units each measured 1x1 m. Contiguous with Test Unit 1, Test Unit 3 was placed at the bottom of the Backhoe Trench 1 safety bench to further investigate burned rock Feature 1. Due to its location, the maximum dimensions of Test Unit 3 were 100 cm north-south by 70 cm east-west. Since the upper matrix had been previously removed by the backhoe, the excavation of Test Unit 3 began with Level 11 (96–110 cm) and continued down to 150 cm.

Extent and Depth

The terrace is delimited by the Leon River and its tributary on the west and south, respectively. The terrace, however, extends a few hundred meters east and north. Based on the testing results, the site covers approximately 80 m north-south by 35 m east-west. Multiple occupations are identified by the presence of discrete features and associated cultural materials. The first occupation zone occurs at 70–110 cm, as evidenced by Features 1 and 5. Two additional occupation zones are present at 125–140 cm, as evidenced by Features 2 and 3, and at 182–189 cm based on the presence of Feature 4.

Sediments and Stratigraphy

All four backhoe trenches exhibited similar profiles, with detailed descriptions presented for Backhoe Trenches 1 and 4 (see Appendix B). The profile of Backhoe Trench 1 revealed a 65-cm-thick Ford alluvial drape (AC horizon) overlying a clayey upper West Range deposit capped by the Leon River paleosol (2Ab-2Bwb-2Ck). Backhoe Trench 4 exhibited a 68-cm-thick Ford alluvial mantle (AC horizon) overlying an upper West Range deposit capped by the Leon River paleosol (2Ab-2Bwb-2C).

Definition of Analysis Units

Based on the presence of different alluvial units and separable prehistoric occupations, three analysis units are defined. Yielding no distinguishable intact cultural deposits, the Ford alluvium is designated Analysis Unit 1. Analysis Units 2 and 3 correspond to cultural deposits buried in the Leon River paleosol of the West Range alluvium. Although abundant cultural materials occur throughout the paleosol, two separable occupation zones are delineated based on the presence of discrete and dated features.

Analysis Unit 1

In all of the test excavations, Analysis Unit 1 was encountered from the surface to 65–70 cm. No cultural materials were observed in the backhoe trenches. Test Units 1 and 2 produced sparse prehistoric remains; 2 of the 14 levels (14.3 percent) produced one small burned rock and one unmodified mussel shell valve. These items occurred only at the contact (60–70 cm) between Analysis Units 1 and 2. These cultural deposits are too sparse to constitute a viable occupation zone.

Analysis Unit 2

Underlying the Ford alluvium, Analysis Unit 2 encompasses the uppermost portion (Ab-Bwb) of the Leon River paleosol encountered at 70–120 cm in Test Units 1 and 2 and at 96–120 cm in Test Unit 3. Producing abundant prehistoric materials, Analysis Unit 2 includes Feature 1 (a hearth) in Test Units 1 and 3.

Cultural Materials

In Test Unit 1, five levels produced a total of 574 prehistoric items with unmodified mussel shells and burned rocks comprising approximately 80 percent of the assemblage (Table 17). Modified faunal materials include one cut mussel shell, and temporally diagnostic artifacts

Table 17. Distribution of cultural materials from Analysis Unit 2, 41CV1482

Depth (cm)	Arrow points	Dart points	Other stone tools	Unmodified debitage	Modified shell	Unmodified bones	Unmodified shells	Burned rocks (kg)
TEST UNIT 1								
70–80	–	–	2	5	–	3	6	19 (0.5)
80–90	1	–	0	16	–	4	84	45 (3.0)
90–100	–	–	1	3	–	12	28	80 (4.5)
96–109/Feature 1	–	–	–	–	–	–	2	see TU 3
100–110	–	–	–	11	1	22	57	40 (6.5)
110–120	–	1	2	19	–	9	66	35 (4.5)
Subtotal	1	1	5	54	1	50	243	219 (19.0)
TEST UNIT 2								
70–80	–	–	–	8	–	–	10	29 (0.5)
80–90	–	–	1	2	–	3	25	48 (1.3)
90–100	–	–	–	5	–	2	28	51 (1.5)
100–110	–	–	1	14	–	5	58	51 (2.0)
110–120	–	–	1	25	–	10	72	51 (2.0)
Subtotal	0	0	3	54	0	20	193	230 (7.3)
TEST UNIT 3								
96–109/Feature 1	–	1	–	3	–	1	7	101 (33.0)
96–110	–	–	1	2	–	2	14	37 (2.5)
110–120	–	–	–	3	–	2	29	20 (2.5)
Subtotal	0	1	1	8	0	5	50	158 (38.0)
TOTAL	1	2	9	116	1	75	486	607 (64.3)

consist of a bulbar stemmed arrow point at 82 cm and a Zephyr point at 119 cm. Five levels excavated in Test Unit 2 yielded 500 cultural items. As with Test Unit 1, the assemblage consists primarily of unmodified mussel shells and burned rocks (ca. 85 percent). Three levels in Test Unit 3 contained 223 prehistoric items, with burned rocks (71 percent) the dominant material. Found within the matrix of Feature 1 at 104 cm, a Zephyr point is the only diagnostic artifact recovered from the test unit.

Cultural Features

Feature 1 is a hearth encountered in the eastern quarter of Test Unit 1 and across the majority of Test Unit 3 at 96–109 cm (Figures 53 and 54). Its maximum excavated dimensions are 90 cm east-west by 80 cm north-south, but the feature was still visible in the east wall of Backhoe Trench 1. The hearth consisted of 101 burned rocks (33 kg), with approximately 80 percent being fist-sized or smaller angular pieces. The remaining 20 percent were tabular pieces averaging 5–10 cm long, 5 cm wide, and 3 cm thick. Most were horizontally laid, but a few were vertical. Constructed of two rock layers, the lower layer was most apparent toward the feature's center, but no basin shape was apparent in cross section. Cultural materials from the feature matrix include seven unmodified mussel shell valves (two are burned), three flakes, one Zephyr point, and one bone. The same types of cultural materials were present in the sediment surrounding the feature, with the assemblage consisting primarily of burned rocks and unmodified mussel valves. A flotation sample collected from the feature fill produced no identifiable carbonized plant remains (see Appendix D). Paired radiocarbon assays on charcoal and a *Rabdotus* snail from Feature 1 yielded ages of 1060 ± 60 B.P. and 1340 ± 60 B.P., respectively

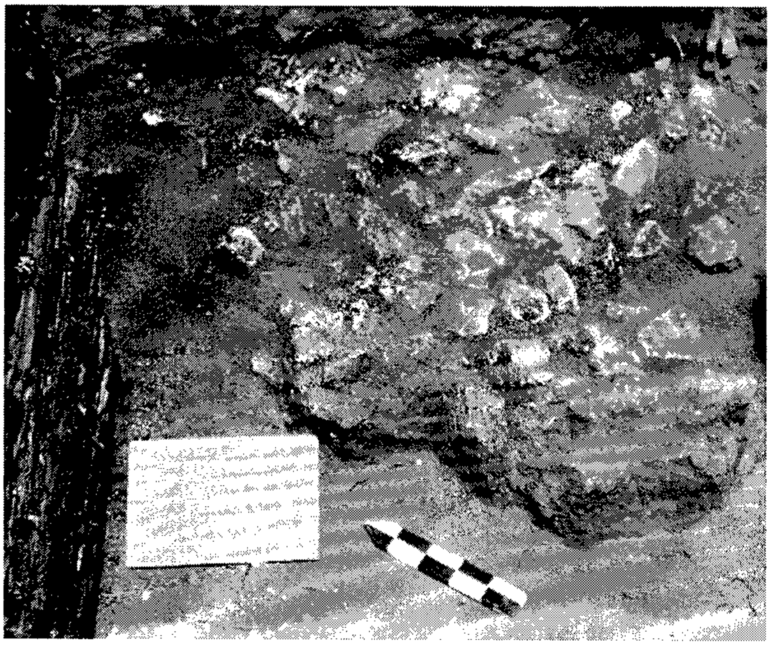

Figure 53. View northeast of Feature 1 at 100 cm in Test Units 1 and 3, 41CV1482.

(see Appendix A).

Although not excavated, Feature 5 (a probable hearth) was exposed in the west wall of Backhoe Trench 2 at 88–108 cm. The feature measured 69 cm in horizontal extent (north-south) and 20 cm in thickness. Twenty small and medium angular burned rocks, four mussel shells, and two flakes were observed in the feature profile. The burned rocks comprising the southernmost one-third of the hearth were underlain by a 2- to 3-cm-thick charcoal layer. The base of the feature was slightly irregular but appeared to be basin shaped.

Discussion

For various reasons discussed in Appendix A, only the charcoal radiocarbon dates are considered here because they appear to be more reliable than the snail shell dates. A calibrated date of A.D. 898–1023 for Feature 1 indicates that the Analysis Unit 2 occupations occurred during the Late Prehistoric period (Austin phase). A Zephyr point and a bulbar stemmed arrow point found below and above, respectively, the level of Feature 1 suggest occupations during the transition between the Late Archaic period and the Austin phase. Alternatively, the Zephyr point recovered from the hearth matrix probably represents a specimen that was collected for reuse, in which case the occupation may have been primarily during Austin phase times. The chronological evidence is not sufficient to estimate the duration of the Analysis Unit 2 occupations.

The abundant mussel shells indicate a reliance on this aquatic resource for subsistence, while the vertebrate faunal assemblage indicates that deer and turtle were also utilized. Because of the absence of charred plant remains in the matrix of Feature 1, its precise function is not known.

Analysis Unit 3

This unit includes the Bwb horizon of the Leon River paleosol and the uppermost portion of the West Range alluvium, which contains abundant cultural materials and three discrete features. It includes remains at depths of 120–200 cm.

Cultural Materials

A total of 738 items are associated with Analysis Unit 3 (Table 18). Three levels excavated in both Test Units 1 and 3 yielded 205 and 84 prehistoric items, respectively. The assemblage in both test units consists primarily of unmodified mussel shells (ca. 55 percent) and burned rocks (ca. 25 percent). A perforator made on an Ensor point base was recovered at 120–130 cm in Test Unit 1.

Eight levels excavated in Test Unit 2 produced 449 cultural items, with burned rocks (41 percent) and debitage (29 percent) comprising the majority of cultural materials. The only diagnostic is a Frio point found at 150–160 cm.

Cultural Features

Contained at 127–139 cm within the northwest quadrant of Test Unit 2, Feature 2 had maximum dimensions of 50 cm north-south by 40 cm east-west (Figure 55). This hearth consisted

Figure 54. Plan views of Feature 1 at 100 and 110 cm in Test Units 1 and 3, 41CV1482.

Table 18. Distribution of cultural materials from Analysis Unit 3, 41CV1482

Depth (cm)	Dart points	Other stone tools	Unmodified debitage	Unmodified bones	Unmodified shells	Burned rocks (kg)
Test Unit 1						
120–130	–	3	21	7	69	13 (1.5)
126–133/Feature 3	–	–	4	1	32	36 (7.0)
130–140	–	–	1	1	12	3 (0.3)
140–150	–	–	–	–	2	–
Subtotal	0	3	26	9	115	52 (8.8)
Test Unit 2						
120–130	–	1	48	15	41	44 (2.0)
127–139/Feature 2	–	–	4	3	2	13 (5.5)
130–140	–	1	15	3	9	12 (0.8)
140–150	–	3	15	–	5	28 (1.3)
150–160	1	–	10	2	6	10 (0.5)
160–170	–	–	8	8	3	4 (0.3)
170–180	–	–	10	8	3	9 (0.8)
182–189/Feature 4	–	–	18	6	4	47 (12.0)
180–190	–	–	2	–	–	13 (0.8)
190–200	–	–	2	8	2	3 (0.3)
Subtotal	1	5	132	53	75	183 (24.3)
Test Unit 3						
120–130	–	1	7	8	40	20 (1.5)
130–140	–	–	1	3	4	–
140–150	–	–	–	–	–	–
Subtotal	0	1	8	11	44	20 (1.5)
Totals	1	9	166	73	234	255 (34.6)

of a single layer of 13 imbricated burned rocks (5.5 kg). All were fist sized and angular, with most laid horizontally. Upon removing the rocks, a circular stain containing charcoal and burned earth was encountered. The stain was 1–3 cm thick and slightly basin shaped. The feature matrix contained four flakes, two unmodified mussel shell valves, and three bones (including one bird bone). Similar cultural materials were found in the surrounding matrix, with burned rocks and debitage being the dominant types. Sparse charred organic remains were observed in a flotation sample that was processed but not submitted for macrobotanical analysis. Based on their relative stratigraphic positions, Features 2 and 3 appear contemporaneous.

Feature 3 was encountered at 126–133 cm in the southeast quadrant of Test Unit 1 (Figure 56). The excavated portion measured 50 cm east-west by 44 cm north-south, but the feature extended south beyond the limits of the test unit. It did not extend east into the adjacent Test Unit 3. The feature consisted of two layers of burned rocks comprised of ca. 27 small and medium angular pieces and 9 tabular pieces averaging 10x5x2 cm (n = 36, 7 kg). The lower rock layer was concentrated along the south wall in a 5-cm-deep pit representing the center of the feature. Twenty-nine of 32 unmodified mussel shell valves, in addition to diffuse charcoal and burned soil, were among the second layer. Based on the abundance of bivalves and the feature's morphology, this hearth appears to have functioned as a (clam?) baking pit. Additional materials from the feature matrix include four flakes and one bone fragment. Cultural materials found at the same level but surrounding Feature 3 include the perforator made on an Ensor point base. Paired radiocarbon assays yielded ages of 1880 ± 70 B.P. on charcoal and 2040 ± 70 B.P. on a *Rabdotus* snail recovered from Feature 3 (see Appendix A). A sample of the feature sediment was floated but not submitted for macrobotanical analysis; it contained sparse charred organics.

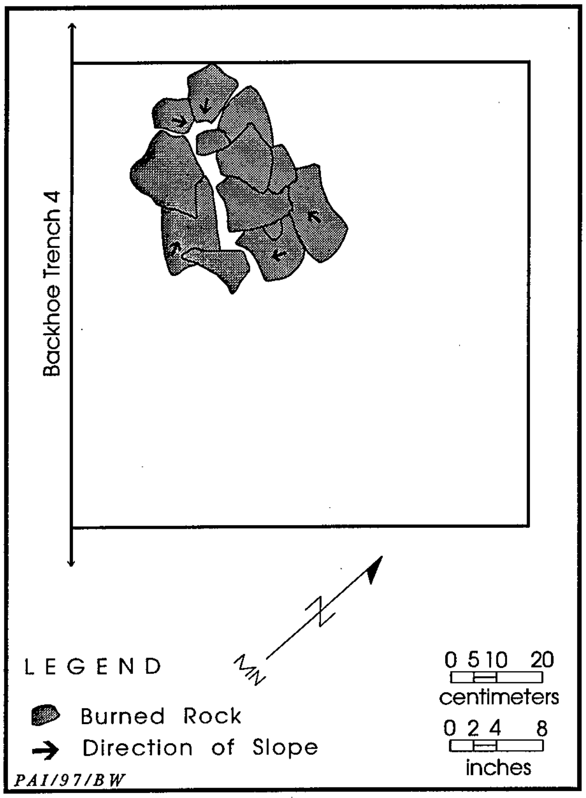

Figure 55. Plan of Feature 2 at 135 cm in Test Unit 2, 41CV1482. Bottom elevations of all rocks range from 130 to 135 cm below surface.

At 182–189 cm, Feature 4 extended across Test Unit 2. This burned rock concentration was visible in all of the test unit profiles and the west wall of Backhoe Trench 4 (opposite Test Unit 2). Thus, the excavated portion of this feature, which measures ca. 180 cm east-west by 100 cm north-south, represents only a small part of a much larger feature. In the test unit, a single layer of 47 horizontally laid angular and tabular burned rocks (12 kg) was interspersed with charcoal, ash, and burned earth. The burned rocks ranged in size from 4x3x2 cm to 11x10x5 cm. The feature matrix contained 18 flakes, 4 unmodified mussel shell valves, and 6 bones. Paired charcoal and *Rabdotus* snail radiocarbon assays yielded ages of 2140 ± 70 B.P. and 2970 ± 60 B.P., respectively (see Appendix A). Although not submitted for detailed analysis, a few flakes of microdebitage, charred wood fragments, and three tiny bone fragments were observed in a processed flotation sample collected from Feature 4.

Discussion

The calibrated charcoal radiocarbon dates and diagnostic artifacts indicate that all of the cultural materials from 120 cm to at least 200 cm correlate to the latter part of Late Archaic period. Occupational evidence found at ca. 120–160 cm (i.e., Features 2 and 3 and associated cultural materials) represents repeated occupations during the transitional Archaic period, i.e., the first few hundred years A.D. This interpretation is substantiated by a calibrated date of A.D. 71–235 and an associated reworked Ensor point for Feature 3 in addition to a Frio point recovered at 150–160 cm. Based on a calibrated date of 348–49 B.C. for Feature 4, another period of intensive occupation during the middle of the Late Archaic may be present below 160 cm. As with Feature 1, the snail shell dates for Feature 3 and 4 are considered less accurate than the charcoal dates.

As with Analysis Unit 2, the invertebrate remains from Analysis Unit 3 indicate that bivalves were a valuable food resource. Subsistence also included hunting and procurement of deer, turtles, toads/frogs, rabbits, and birds as evidenced by the vertebrate assemblage.

Summary and Conclusions

The cultural occupations at 41CV1482 may be summarized relative to the stratigraphic profile and vertical distributions of features and calibrated radiocarbon dates, as shown in Figure 57. This site exhibits evidence of repeated and intensive occupations during the Late Archaic and Late Prehistoric periods. In Analysis Unit 1, sparse prehistoric remains indicate the presence of ephemeral cultural deposits within the Ford alluvium. The archeological remains attributed to Analysis Units 2 and 3 are abundant and include intact features, interpretable artifact assemblages, and well-preserved organic remains. Although no discrete occupation zones were defined based on these limited testing results, the evidence hints that the features and cultural materials in the upper West Range alluvium can be stratigraphically separated into at least two, and probably three or more, discrete occupation periods or components.

The occupational evidence associated with Analysis Units 2 and 3 represents discrete components for which crude rates of deposition may be defined as shown in Figure 58 and Table 19.

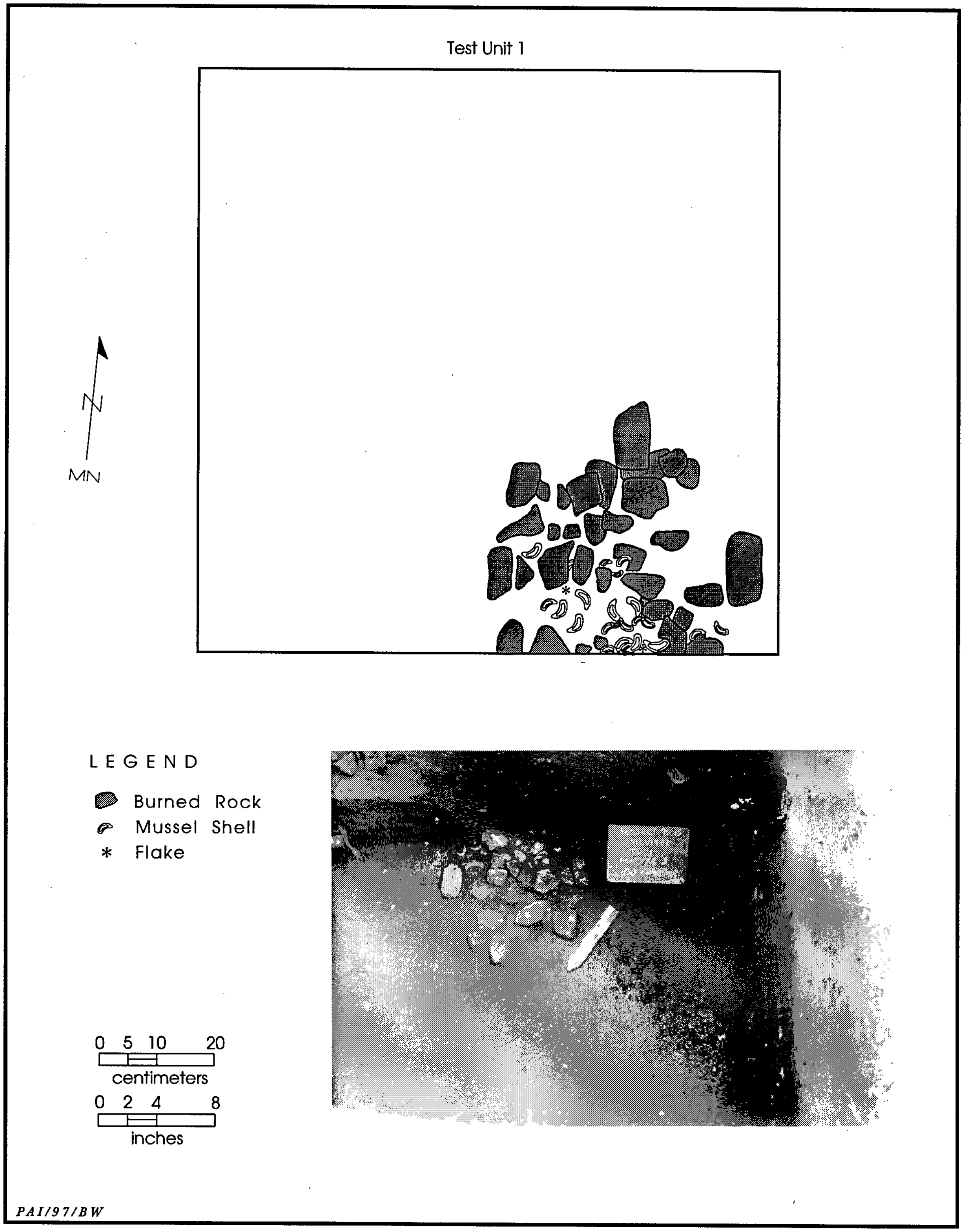

Figure 56. Photograph and plan of Feature 3 at 130 cm in Test Unit 1, 41CV1482. Bottom elevations of all rocks range from 120 to 132 cm below surface.

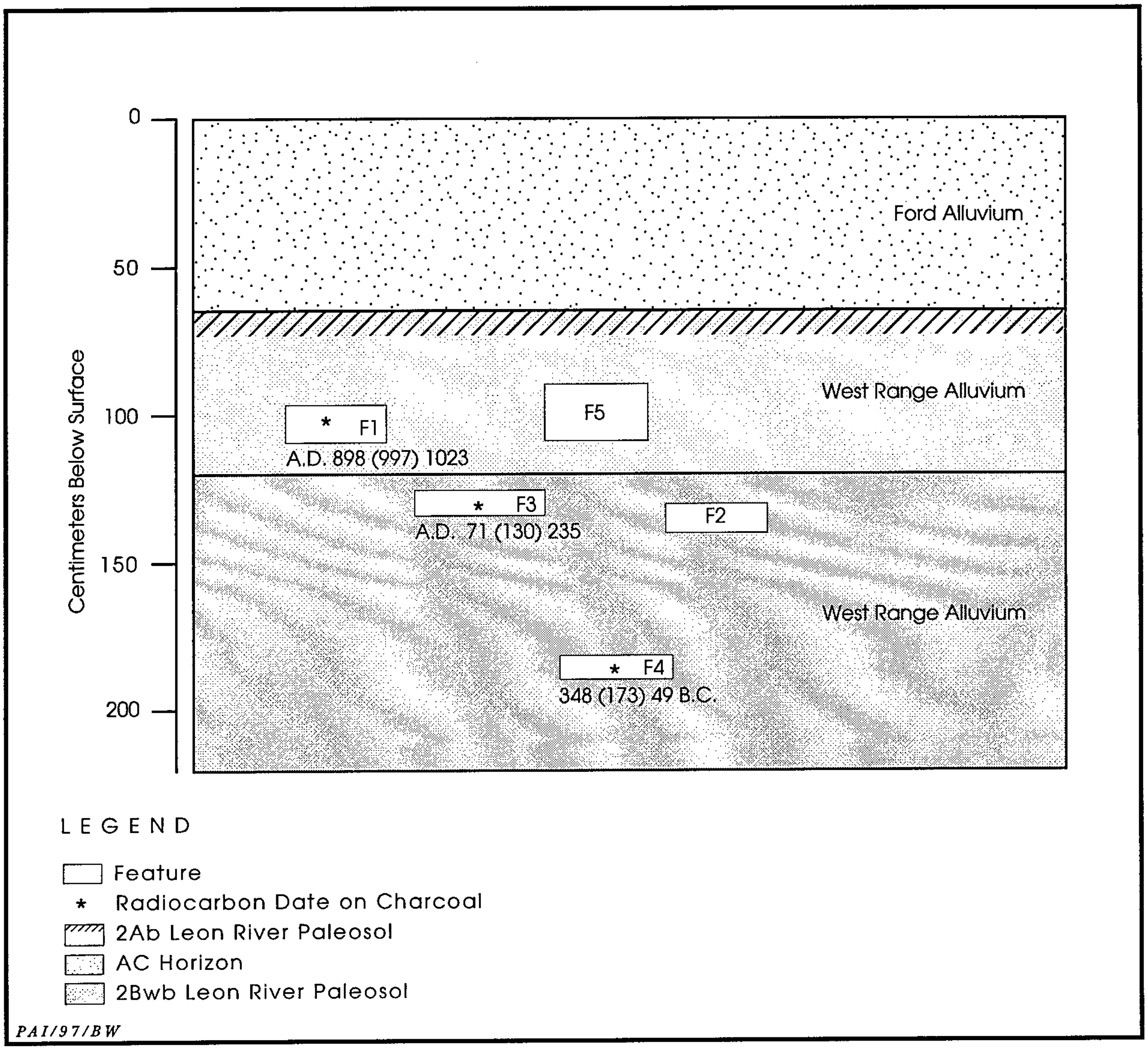

Figure 57. Schematic stratigraphic profile showing relationships between alluvial sediments, cultural features, and calibrated radiocarbon dates at 41CV1482.

For the sediments between any two of the features, the rate of deposition may be figured by taking the amount of alluvial sediment accumulated (in centimeters) and dividing it by the minimum, average, or maximum number of years between the events, based on the calibrated 1-sigma ranges and intercepts. For the 49–63 cm of sediment between Features 4 (at 182–189 cm) and 3 (at 126–133 cm), the span of time represented ranges from 120–583 years, which means that the rate of sediment accumulation may range from 0.84 to 5.25 cm per decade. For the 17–37 cm of sediment between Features 3 (at 126–133 cm) and 1 (at 96–109 cm), the span of time represented ranges from 663–952 years, for a deposition rate of between 0.18 and 0.56 cm per decade.

Possible sources of error for this estimate should be mentioned. Using the data in this manner requires one to assume several things, namely that: (1) the 1-sigma radiocarbon dates are accurate and represent the true time of the feature event; (2) these features are not intrusive and the radiocarbon dates approximate the age of the deposition of the sediments surrounding the features; and (3) there are no erosional unconformities within the Leon River paleosol.

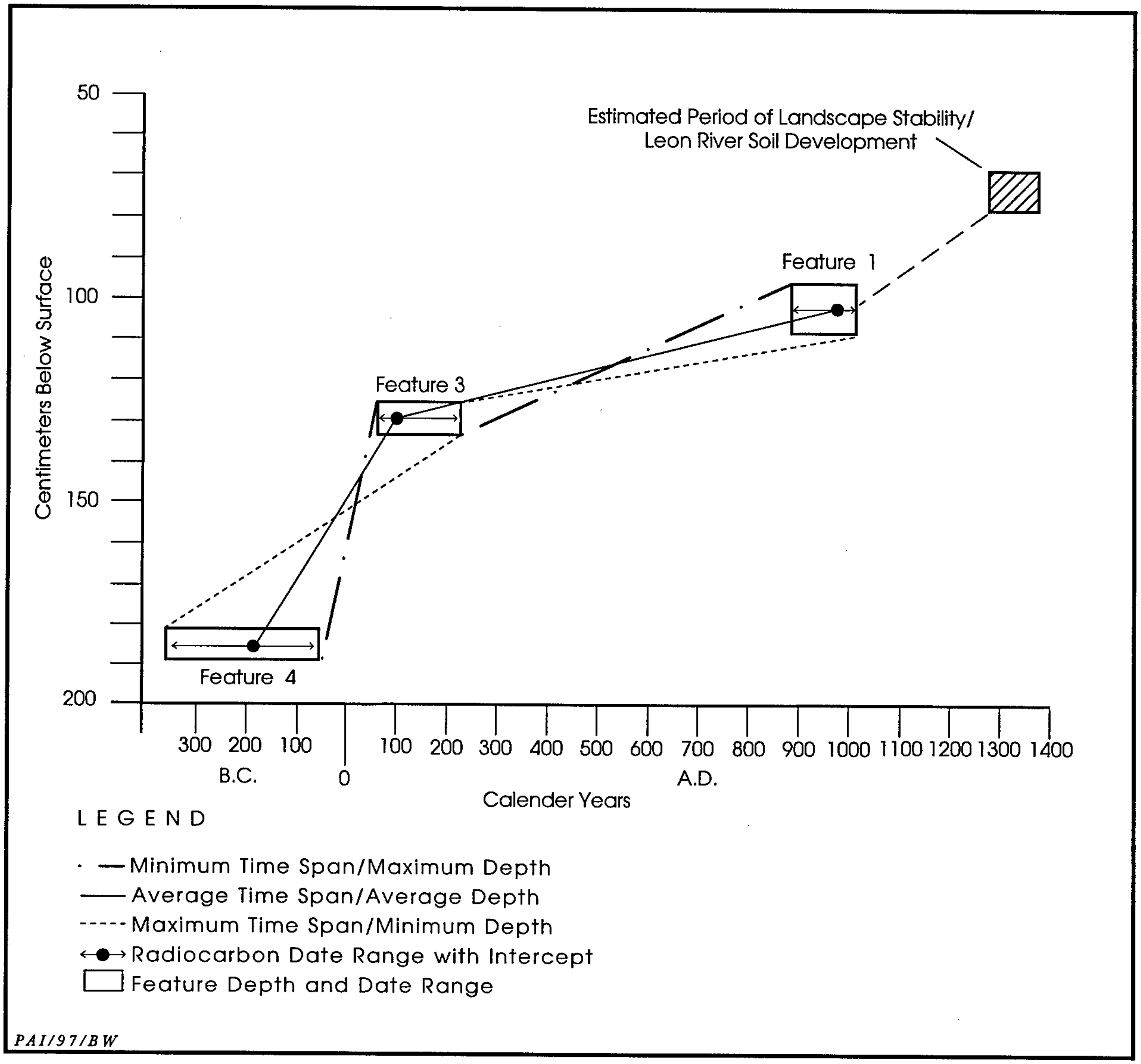

Figure 58. Comparison of feature radiocarbon dates and rates of alluvial deposition in the Leon River paleosol at 41CV1482. The period of landscape stability represented by the Leon River paleosol is an estimate based on the calibration of a charcoal radiocarbon date from a hearth within the buried A horizon at nearby Leon River Cutbank Locality 2 (Nordt 1992:131).

While there is considerable room for error, the available data suggest that all of these assumptions are reasonable.

With these caveats in mind, Figure 58 suggests a dramatic shift in the rate of deposition over time, with the West Range sediments accumulating rapidly between ca. 300 B.C. and A.D. 200 but the rate of deposition slowing considerably after that time. The data indicate that the change in the rate of deposition was significant, with alluvial sediments accumulating somewhere on the order of 1.5 to 29 times slower after ca. A.D. 200. If one looks at the average rates of deposition based on the calibrated intercepts and actual depths of the dated charcoal samples, the data suggest that the rate of deposition was approximately 6 times slower after A.D. 200; however, there is no particular reason (statistical or otherwise) to think that this average is truly meaningful. Consequently, it is safe to say that the evidence suggests a significant change in the rate of deposition, but it does not support any reasonable inferences on the

Table 19. Rate of deposition data for 41CV1482

Time span in years	Amount of deposition	Rate of Deposition (cm per decade)
Feature 3 (126–133 cm) to Feature 1 (96–109 cm)		
Minimum = 663	37 cm	0.56
Average = 867	26 cm	0.30
Maximum = 952	17 cm	0.18
Feature 4 (182–189 cm) to Feature 3 (126–133 cm)		
Minimum = 120	63 cm	5.25
Average = 303	55 cm	1.82
Maximum = 583	49 cm	0.84

magnitude of the change. The fact that the A horizon of the Leon River paleosol formed at all also is evidence of this decrease in sedimentation, although this is in no way quantifiable.

What this means in terms of archeological integrity is that Analysis Unit 3 contains two discrete cultural zones (represented by Features 4 and 3) that have a high degree of stratigraphic and chronologic integrity and that probably represent fairly short periods of occupation. In contrast, the Analysis Unit 2 cultural zone associated with Feature 1 may represent occupations that occurred over a longer period of time (but just how long per centimeter of sediment is simply guesswork). Although it may be tempting to discount the research potential of Analysis Unit 2 because of perceived integrity problems, it would be unwise to do so on the basis on such limited evidence. While Analysis Unit 3 certainly contains archeological evidence worthy of further investigation, these data should not be taken to mean that the cultural evidence in Analysis Unit 2 is not as robust or significant. At one end of the spectrum, the Analysis Unit 2 cultural evidence at 90–110 cm below the surface might be viewed skeptically if it were thought to represent occupations that occurred over 1,111 years (assuming a rate of 0.18 cm per decade). Conversely, perceptions of the integrity of this cultural zone are quite different if this same evidence represents a span of 357 years (assuming a rate of 0.56 cm per decade) or less.

41CV1487

Site Setting

Site 41CV1487 is situated on a narrow terrace (T_1) wedged between the Leon River channel on the north and a higher Pleistocene terrace (T_2) and associated slope on the south (Figure 59). The lower terrace supports large hardwood trees including bois d'arc, oak, and cedar elm. A ground cover of grasses, greenbrier, poison ivy, and wildflowers affords very poor surface visibility. The Leon River cutbank, with a maximum thickness of 6 m, is vertical to moderately sloping (Figure 60). Greenbrier and poison ivy obscure the upper meter of the deposit; however, the remainder of the cutbank is completely visible. The area is presently used for grazing cattle, and the primary site disturbance is erosion resulting from fluctuations in the water level of the Leon River. Site elevation is 220 m above mean sea level.

Previous Work

On 6 February 1990, Sanchez, Vandersteen, and Brown (Texas A&M University) recorded the site. In the cutbank of the Leon River, mussel shells, burned rocks, and one flake were observed within a cultural lens that measured 150 cm long and 15 cm thick. Since the cutbank was too steep to be examined closely, the cultural materials were estimated to be 490 cm below the surface. Maximum site dimensions were estimated to be 18 m east-west by 10 m north-south, with approximately 50 percent of the site disturbed by erosion. Since intact cultural materials were present, testing was recommended to determine the site's eligibility for listing in the National Register of Historic Places (Carlson et al. 1994:75–76).

Work Performed

Prior to excavation, the Leon River cutbank

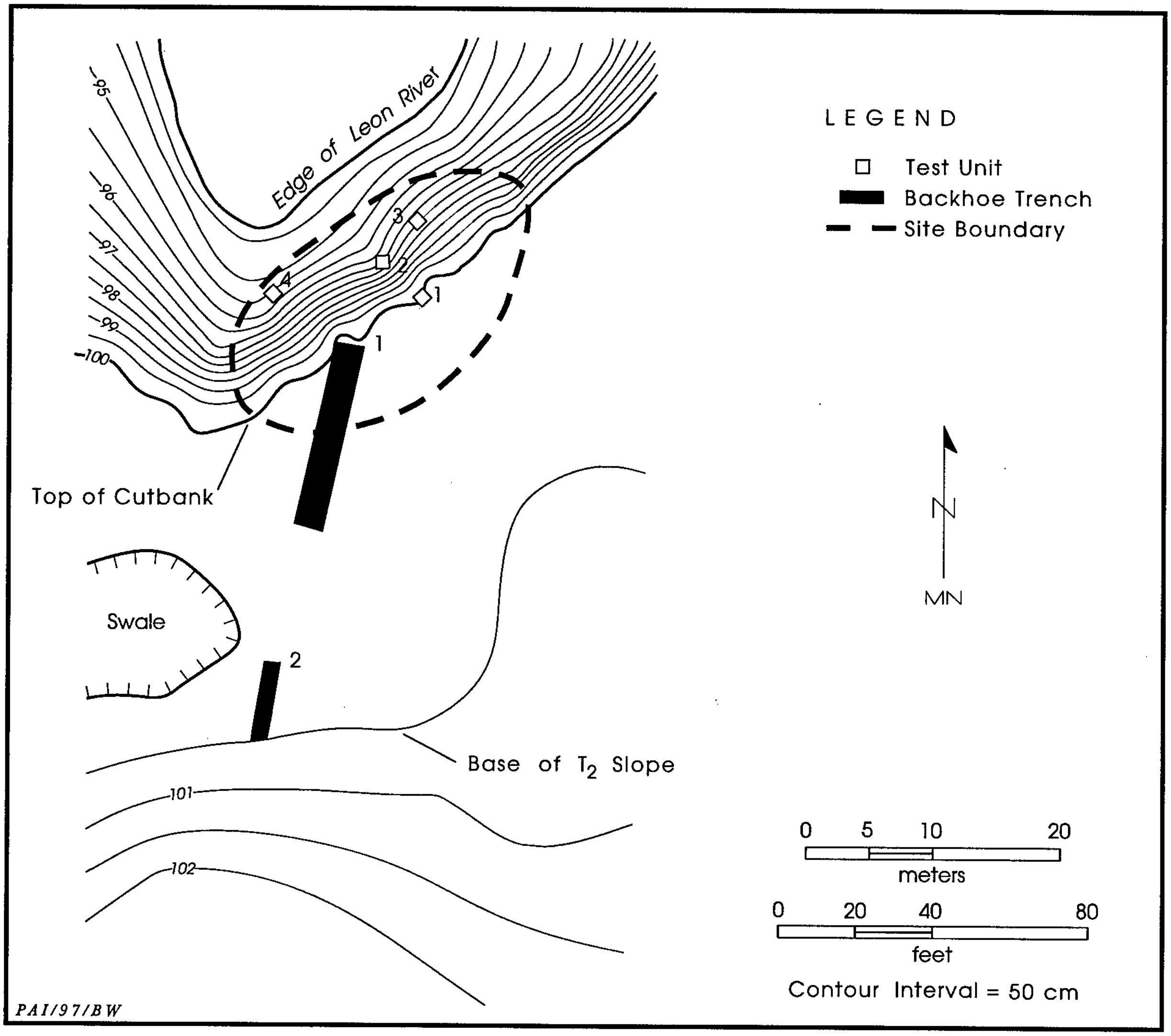

Figure 59. Site map of 41CV1487.

was reinspected and three possible cultural lenses at approximately 380, 450, and 580 cm below the present surface were observed. The lenses consisted of several discontinuous series of mussel shells and burned rocks within an exposure about 20 m long and 2 m thick. During the course of the test excavations, the Leon River crested and the water level rose to the upper edges of the cutbank (Figure 61). The river receded approximately three weeks after cresting, but the lowermost lens noted at 580 cm was no longer visible since the river did not drop to its previous lower level. At the time that site testing was in progress, the water level was at approximately 550–650 cm below the T_1 surface.

Formal testing of 41CV1487 was completed on 28 August 1995. The test excavations included two backhoe trenches and four test units. A total of 7.2 m^2 was manually excavated.

Located at the site's center, Backhoe Trench 1 was two meters from, and perpendicular to, the edge of the Leon River cutbank above the lens noted at 380 cm. The trench measured 15x1.5x4.3 m, was oriented to 13°, and contained no cultural materials. Within two weeks of excavation, half of the trench filled with water. Approximately 12 m south of Backhoe Trench 1, Backhoe Trench 2 was placed at the contact between the distal portion of the terrace and the toeslope. This trench was oriented to 5° and had

Figure 60. Site overview showing the Leon River and cutbank at normal flow, facing southeast, 41CV1487.

Figure 61. The Leon River at flood stage with person standing near the edge of the cutbank facing southeast, 41CV1487.

dimensions of 8x0.80x2.7 m. No cultural materials were observed, although close examination and description of the profiles were not possible. Immediately after being excavated, the trench was flooded with water discharging from its southern end. At this time, Backhoe Trench 2 was backfilled.

Since all observed cultural materials were buried at great depths in the cutbank, all of the test units were placed along the slope of the Leon River cutbank. Test units were placed at various levels to sample all of the alluvial deposits, to facilitate excavation, and to ensure safety (Figure 62).

Excavated to 390 cm, Test Unit 1 was placed along the edge of the nearly vertical cutbank approximately 5 m northeast of Backhoe Trench 1, perpendicular to the cutbank, and oriented to 315°. At the ground surface adjacent to the northwest corner of the unit, a datum was established for elevation control. Since this test unit was intended as a deep excavation, its initial dimensions were 140 cm north-south by 100 cm east-west. This was done to stairstep the excavation with depth for safety reasons. The unit size was 140x100 cm for the first 10 levels, ending at a natural stratigraphic break at 94 cm. The unit size was then decreased to 100x100 cm from Level 11 to Level 39 (94–390 cm). The 40-cm-wide bench along the unit's south wall was left unexcavated to serve as a step-down. The deposit from the surface to 94 cm consisted of recent overbank, natural levee, and alluvial fan sediments that contained reworked cultural materials from prehistoric site 41CV1472 situated upslope to the south. This matrix was removed and not screened.

Test Units 2–4 were located on various gradients of the cutbank. For consistency, each unit's datum (i.e., the highest corner of each test unit) for elevation control was established relative to the aforementioned datum adjacent to Test Unit 1. The elevations noted below for the beginning levels of Test Units 2–4 are due to

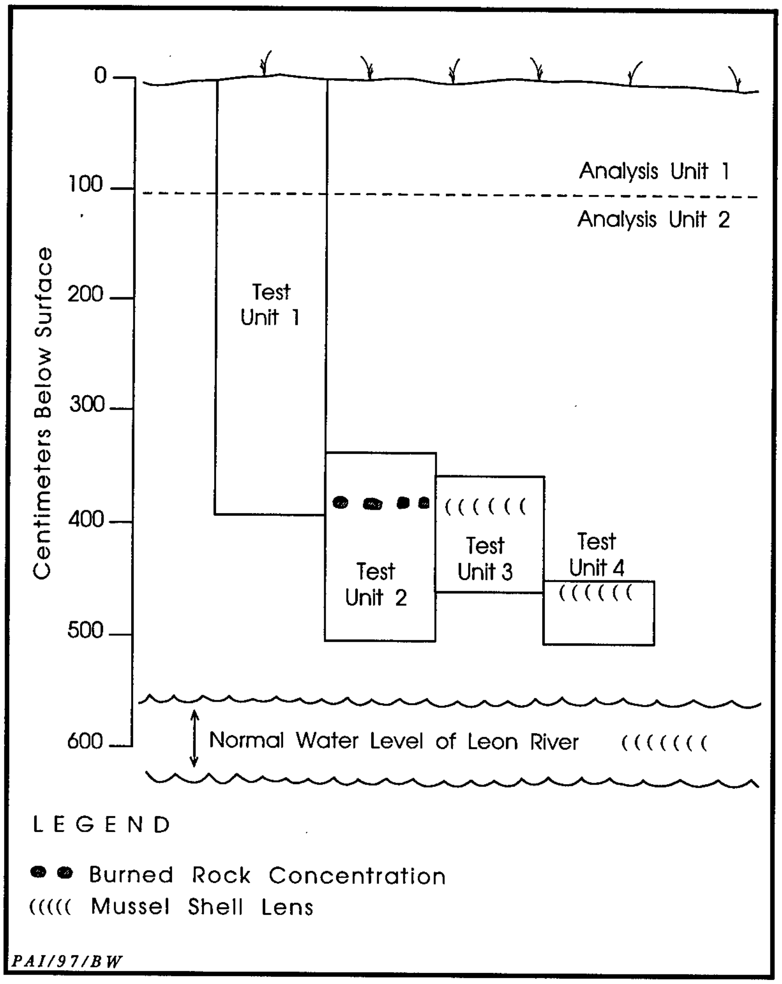

Figure 62. Generalized stratigraphic profile of the Leon River cutbank showing relative vertical positions of test units and features, 41CV1487.

their placement at different points on the cutbank slope. For the same reason, all three test units initially measured 100 cm east-west but averaged only 30 cm north-south. With depth, these were enlarged to 1x1 m.

Located 2.1 m northwest of Test Unit 1, Test Unit 2 was placed on the cutbank above some burned rocks exposed at 380 cm. Oriented to 356°, the excavation began with Level 34 (334–340 cm) and continued to 500 cm. Test Units 3 and 4 were placed 2 m east and 9.1 m west of Test Unit 2, respectively. Test Unit 3, oriented to 320°, was situated above a shell lens exposed at 380 cm. The excavation started at Level 36 (354–364 cm) and ended at 454 cm. Test Unit 4, oriented to 330°, was placed above some mussel shells that were visible at 450 cm. Beginning at Level 45 (443–450 cm), the excavation was terminated at 500 cm due to water seepage from the Leon River.

Extent and Depth

The northern and southern edges of the terrace are delimited by the Leon River and a Pleistocene terrace, respectively. The landform, however, continues to the east and west for hundreds of meters. The site boundaries are delineated by the limits of exposed cultural materials in the Leon River cutbank and test excavation results. Based on the areal extent of the cultural materials, the site dimensions are estimated to be 20 m east-west by 5 m north-south.

Although subsurface cultural materials were encountered to a maximum depth of 500 cm, no discrete occupations can be identified due to the presence of ephemeral cultural deposits or the lack of contextual integrity.

Sediments and Stratigraphy

The profile of Backhoe Trench 1 (see Appendix B) revealed an 85-cm-thick interbedded zone of Ford overbank, alluvial fan, and natural levee facies overlying a West Range alluvial unit 334+ cm thick. The Ford alluvial units sandwich a 36-cm-thick alluvial fan deposit comprised of a yellowish brown silty clay loam and redeposited hard calcium carbonate nodules along the base of the deposit. The alluvial fan sediments are most likely derived from the Jackson alluvium of the T_2 terrace, approximately 25–30 m to the south. The fan sediments overlie Ford natural levee deposits (2AC-2C profile). The levee facies bury a West Range fill, which is capped by the Leon River paleosol (3Ab-3ABb-

3Bk-3Ck-3Cg profile).

Definition of Analysis Units

Based on the presence of different depositional units, two analysis units are defined (see Figure 62). Analysis Unit 1 subsumes the Ford alluvium, which includes reworked sediments from the Pleistocene terrace situated upslope. This analysis unit was encountered in Backhoe Trench 1 and Test Unit 1 from the surface to maximum depths of 85 and 94 cm, respectively.

Analysis Unit 2 encompasses the West Range alluvium capped by the Leon River paleosol. As evidenced by the test excavations and cutbank exposures, Analysis Unit 2 underlies Analysis Unit 1 and extends from ca. 90 to 600 cm.

Analysis Unit 1

Eight pieces of debitage and five burned rocks were observed (but not collected) at 0–94 cm in Test Unit 1. The cultural materials were noted near the base of a soil contact at 45 cm, which corresponds to the boundary of the reworked deposits from the Pleistocene terrace and the natural levee (Ford) deposits. Although cultural materials were observed, they are present only in deposits that have been reworked downslope from a Pleistocene terrace on which prehistoric site 41CV1472 is located. Therefore, the cultural materials lack contextual integrity.

Analysis Unit 2

Cultural Materials

From Test Units 1–4, the total inventory of cultural materials found below 94 cm consists of 9 pieces of debitage, 2 unburned bone fragments, 25 small burned rocks, and 133 unmodified mussel shell valves. Although 31 of 61 levels (51 percent) contained cultural remains (assuming that all of the unmodified mussel shells are cultural), 26 (84 percent) of the positive levels yielded five or fewer items. However, the number of mussel shell valves (n = 104) and burned rocks (n = 11) peaked at 364–400 cm in Test Units 2 and 3. This increase coincided with discontinuous lenses of the same material types observed at 380 cm in the cutbank exposure. Mussel shells and/or burned rocks were not sufficiently concentrated to warrant designation as features. One observation concerning the texture of the mussel shells is noteworthy. When removed from the matrix, some shells disintegrated and most were very chalky. This lack of structure probably resulted from repeated episodes of wetting and drying due to fluctuations in the water level of the Leon River.

Discussion

Due to sparse cultural materials in the majority of levels excavated (including those in the Leon River paleosol), stratigraphically discrete cultural components are indistinguishable. An exception to this is evidenced by higher frequencies of mussel shells and burned rocks at ca. 380 cm in two test units. The previously mentioned field observations suggest that most of the site has been eroded away due to the lateral migration (southward) of the Leon River, leaving a small portion of the site exposed in the cutbank. The remaining cultural remains/mussel shells have been and continue to be severely affected by frequent wetting and drying due to the fluctuating water level. The presence of extremely chalky mussel shells is indicative of severe weathering and deterioration, and it is likely that any organic remains in these deposits have been seriously altered. In sum, the Leon River has substantially compromised the integrity of the sparse cultural remains.

41CV1549

Site Setting

Site 41CV1549 is located within a large meander bend on the south side of Cowhouse Creek, which defines the eastern site boundary (Figure 63). A gully formed at the contact of the Holocene (T_1) and Pleistocene (T_2) terraces defines the southern margin of the site. The site extends north across the T_1 surface at 240 m above mean sea level onto the distal portion of an extensive floodplain (T_0) of Cowhouse Creek. Several military vehicle trails are present throughout the site area. The western half of the site appears to have been previously cultivated, as evidenced by soil conservation contour terraces, and is currently covered with scattered secondary mesquite and juniper growth. The eastern half and northern margin of the site

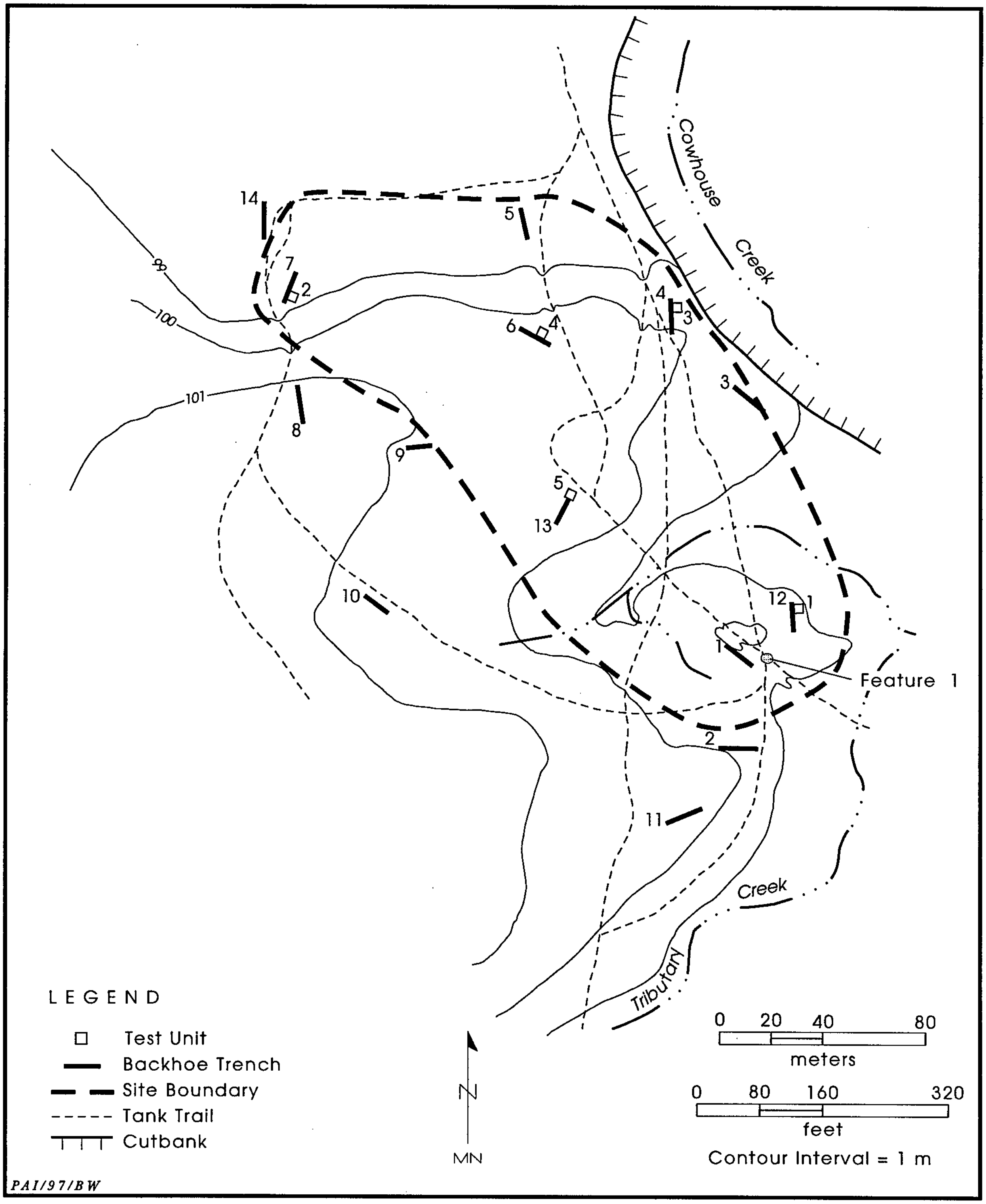

Figure 63. Site map of 41CV1549.

apparently have been disturbed only by tank trails, and both areas support a dense oak, cedar elm, and juniper forest.

Previous Work

The site was originally identified by Frederick and Quigg (Mariah Associates) in January 1992 while they were conducting a reconnaissance survey. It was not formally recorded at this time but was assigned the temporary site number MA 92-1.

Mehalchick and Frederick (Mariah Associates) formally recorded the site on 3 March 1993 as an open campsite situated on the T_1 surface of Cowhouse Creek, possibly extending down to the T_0 surface at the north boundary. The site boundaries (350 m north-south by 200 m east-west) were defined by the extent of surface cultural materials. A 5-m-diameter burned rock concentration (Feature 1) and scatters of flakes, bifaces, cores, mussel shells, and burned rocks were observed within tank trails and roadcuts. The majority of the cultural materials appeared to be shallowly buried within a Holocene alluvial fill, which was suspected to be equivalent to the West Range alluvium (Nordt 1992). However, an accurate identification could not be made due to the lack of vertical exposures. The T_0 surface north of the site appeared to be underlain by Ford alluvium, and the T_2 surface southeast of the site was observed to be underlain by Jackson alluvium.

Since the site had the potential to contain intact, buried cultural deposits, a crew returned on 10 March 1993 and excavated 70 shovel tests to 40 cm on the T_1 surface. All of these shovel tests were excavated near burned rock and lithic scatters visible on the surface in the central part of the site, but only five yielded cultural materials. Recovered artifacts included nine flakes, three bone fragments, and one mussel shell. Two charcoal samples were recovered from a shovel test placed at Feature 1 at the southeast margin of the site.

On the basis of shovel testing and field observations, the site appeared to contain shallowly buried occupations of unknown significance; in addition, deeply buried cultural deposits were potentially present beneath the T_1 and T_0 surfaces. A formal testing effort of six backhoe trenches (at least two to be placed on the T_0 surface) and up to 6 m^3 of manually excavated test pits was recommended to assess the site's NRHP eligibility (Trierweiler, ed. 1994:A1559–A1561).

Work Performed

Formal testing of 41CV1549 was completed on 24 July 1995. The Cowhouse Creek and gully cutbanks were reinspected for cultural materials at this time, but none were observed. Fourteen backhoe trenches and five 1x1-m test units were excavated. A total volume of 7.4 m^3 was manually dug.

The backhoe trenches were 10–12 m in length, 0.8–1.5 m in width, and 2.1–3.8 m in depth (Table 20). Backhoe Trenches 1–4, 6, and 8–13 were placed on the T_1 terrace surface, while Backhoe Trenches 5, 7, and 14 were placed on the more-distal portion of the floodplain (T_0) along the site's northern boundary.

Backhoe Trenches 1 and 12 were placed west and northeast of Feature 1, respectively. Only a few burned rocks were observed in the upper 20 cm of Backhoe Trench 1; however, numerous burned rocks, pieces of debitage, and mussel shells were encountered at approximately 50–150 cm

Table 20. Summary of backhoe trenches, 41CV1549

Backhoe Trench	Length (m)	Width (m)	Depth (m)	Long axis orientation (magnetic north)	Cultural materials observed
1	10.0	1.5	3.5	313°	yes
2	10.0	1.5	3.8	272°	no
3	10.0	1.5	3.6	311°	no
4	12.0	1.5	3.7	185°	yes
5	10.0	1.5	3.4	350°	no
6	10.0	1.5	3.0	298°	yes
7	10.0	1.5	3.6	202°	yes
8	10.0	1.5	3.5	355°	no
9	10.0	0.8	2.1	265°	no
10	10.0	1.5	3.1	304°	no
11	12.0	1.5	3.6	253°	no
12	10.0	1.5	3.1	353°	yes
13	12.0	1.5	3.0	210°	yes
14	12.0	1.5	3.2	184°	no

in Backhoe Trench 12. Backhoe Trenches 6, 8, and 13 were placed adjacent to areas containing cultural materials exposed within trails on the T_1 surface directly above the floodplain. No cultural materials were found in Backhoe Trench 8. A few burned rocks were observed at 50–60 cm in the south end of Backhoe Trench 6, and several burned rocks were observed at 46 cm in the floor of the north end of Backhoe Trench 13. Backhoe Trenches 3 and 4 were placed directly above the Cowhouse Creek channel, and Backhoe Trenches 2 and 9–11 were scattered across the central and back portions of the T_1 surface. The only cultural materials observed in these trenches consisted of a small burned rock cluster at 160 cm in the east wall of Backhoe Trench 4. On the distal portion of the floodplain (T_0), Backhoe Trench 5 was placed along the northeastern site boundary, and Backhoe Trenches 7 and 14 were placed along the northwestern site boundary. Backhoe Trenches 5 and 14 were culturally sterile, but a lens of burned rocks, mussel shells, and charcoal was observed within a buried soil (2Ab horizon) at approximately 170–200 cm in Backhoe Trench 7.

Test Unit 1 was placed along the east wall of Backhoe Trench 12 and excavated to a culturally sterile level at 190–200 cm. Test Unit 2, excavated to 210 cm, was placed along the east wall of Backhoe Trench 7 over the lens of cultural materials observed within the buried soil (2Ab horizon) at 170–200 cm. Test Unit 3, excavated to 170 cm, was placed above the small cluster of burned rocks (Feature 3) observed at 147–162 cm in the east wall of Backhoe Trench 4. Test Unit 4, excavated to 90 cm, was placed above the few burned rocks observed at 50–60 cm in the east wall of Backhoe Trench 6. Test Unit 5, excavated to 70 cm, was placed above the burned rocks (Feature 5) exposed at ca. 46 cm in the floor of Backhoe Trench 13.

Extent and Depth

The horizontal extent of the site was previously defined based on the extent of surface cultural materials; however, testing results indicate that subsurface cultural deposits are restricted to approximately the eastern half of the T_1 surface and the more central portion of the distal periphery of the T_0 surface. However, because the T_1 and T_0 surfaces rise approximately 10 m and 5–36 m, respectively, above Cowhouse Creek, the entire vertical extent of the Holocene deposits was not investigated. Site size is estimated to be 100 m northeast-southwest by 280 m northwest-southeast. Cultural materials are present from the surface to a depth of at least 200 cm in some parts of the site.

Sediments and Stratigraphy

The profiles of five trenches (Backhoe Trenches 1, 2, 4, 6, and 7) are described in Appendix B and correlated with the fill observed in the remaining trenches. The backhoe trenches reveal a complex series of multiple alluvial fills under both construction surfaces. Alluvial units comprising the T_1 terrace include both upper and lower West Range units and Georgetown alluvium. The 11 trenches excavated on the T_1 surface can be sorted into three groups based on similarly present alluvial units, depositional facies, and soil profiles. Of all the trenches on the T_1 surface, Backhoe Trenches 2, 10, and 11 are the most likely to have intersected buried deposits predating the West Range unit due to their placement in the middle and more distal portions of the surface. These trench profiles include three stratigraphic units. Backhoe Trench 2 reveals a 378-cm-thick profile of upper (A-Bk-C-2Ab-2Bkb profile) and lower (3C profile) West Range units overlying a truncated Royalty paleosol/Georgetown alluvium (4Bt-4C profile). Farther out from the center of the T_1 terrace surface, a group of six trenches (Backhoe Trenches 1, 6, 8, 9, 12, and 13) reveals thick profiles of clayey and loamy overbank facies of upper West Range age. Along the periphery of the T_1 terrace, a facies change from predominantly muddy overbank deposits to sandy channel fill and channel margin deposits occurs in the upper and lower West Range units. This lateral facies change is represented in the profiles of Backhoe Trenches 3 and 4. The profile of Backhoe Trench 4 is a 336-cm-thick series of natural levee and point bar deposits that include lower West Range sediments (237–336+ cm) at the base of the profile.

The three trenches (Backhoe Trenches 5, 7, and 14) excavated on the T_0 floodplain surface revealed Ford alluvium overlying upper West Range deposits. The Ford alluvium of the floodplain becomes progressively younger toward Cowhouse Creek due to the creek's continuing lateral migration northward. Therefore, the

more distal floodplain location of Backhoe Trench 7 should yield the oldest Ford alluvium. The underlying upper West Range deposit is imprinted with a series of soils (2Ab-2Bwb-3Ab-3Bwb profile) in Backhoe Trench 7. Radiocarbon assays indicate that the upper buried soil is a lateral extension of or equivalent to the modern soil mantle on the T_1 terrace.

Definition of Analysis Units

With the exception of a few artifacts found in the Ford sediments, all cultural materials were recovered from the upper West Range alluvial unit (hand excavation units did not intersect the lower West Range alluvium). Based on the radiocarbon ages obtained from various locations within this unit, it contains cultural materials representing occupations during both the Late Prehistoric and Late Archaic periods. Therefore, the deposits excavated from the test units are vertically separated into the Late Prehistoric (Analysis Unit 1) and the Late Archaic (Analysis Unit 2) periods for the following interpretations.

Analysis Unit 1

The deposits defined for Analysis Unit 1 include all of Test Unit 2 (0–210 cm), the upper 40 cm of Test Unit 4, the upper 50 cm of Test Units 1 and 5, and the majority of Test Unit 3 (0–140 cm). While the definition of Analysis Unit 1 deposits within Test Unit 2 is based on a conventional radiocarbon age obtained from the base of the unit (discussed below), the excavation levels within the other test units are arbitrarily divided into upper and lower sections (Late Prehistoric and Late Archaic, respectively) of the upper West Range deposits, based on correlations of subtle sedimentological changes and vertical distributions of artifacts between test units.

Cultural Materials

The fairly small artifact assemblage recovered from Analysis Unit 1 includes 70 pieces of unmodified debitage and a bifacial knife. Other cultural materials recovered include approximately 9 kg of burned rocks, 15 bones, and 9 mussel shells. Although small amounts of these artifacts were found in Test Units 1, 3, 4, and 5, the majority were recovered from the 2Ab horizon investigated in Test Unit 2, which also contained the only identified subsurface feature (Feature 4) within this analysis unit.

Cultural Features

Two burned rock concentrations were identified in Analysis Unit 1. Feature 1 was defined by the initial investigators as a 5-m-diameter burned rock concentration situated within a tank trail at the southeast margin of the site. It appears that this feature is a highly disturbed surface anomaly since only a few burned rocks were found at 0–20 cm in Backhoe Trench 1, which was excavated immediately adjacent to the exposed concentration.

A burned rock concentration (Feature 4) was encountered at the base of the 2Ab horizon at 190–200 cm in Test Unit 2. This feature was composed of a single layer of 54 angular burned rocks (6 kg) clustered within a 70x50-cm area in the southwest corner of the unit. The western ca. one-third of the feature was removed during trenching. No evidence of a pit was recognized, and the rocks appeared to be oriented horizontally in profile. Artifacts found in association with the feature consist of 22 flakes and a mussel shell. A flotation sample was collected from the rock concentration; charcoal from the sample yielded a conventional radiocarbon age of 1180 ± 70 B.P. (see Appendix A).

Discussion

Although a relatively small amount of cultural materials was found in the deposits defined for Analysis Unit 1, Test Unit 2 revealed a discrete lens of buried, well-preserved cultural materials within the A horizon in the distal portion of the floodplain (T_0). The calibrated radiocarbon date obtained from Feature 4 dates this soil horizon to A.D. 779–967. This buried soil extends up onto the T_1 terrace, where it is the modern soil mantle. Although this surficial soil also contains a limited amount of Late Prehistoric materials, the component has limited research potential due to disturbances to the terrace surface and surficial nature of the materials. Thus, only the T_0 portion of Analysis Unit 1 has the potential to provide important data for Late Prehistoric occupations (Austin Phase) at Fort Hood.

Analysis Unit 2

Analysis Unit 2 includes the deposits excavated at 50–200 cm in Test Unit 1, 140–170 cm in Test Unit 3, 40–90 cm in Test Unit 4, and 50–70 cm in Test Unit 5. As mentioned above, this vertical separation creates an analysis unit representing Late Archaic cultural materials and deposits.

Cultural Materials

The artifacts recovered from Analysis Unit 2 include 1 untypeable dart point, 9 chipped stone tools, 287 pieces of unmodified debitage, and 1 mano (Table 21). Other cultural materials consist of ca. 72 kg of burned rocks, 41 bones, and 51 mussel shells. Two patterns of vertical distribution of cultural materials are recognized. Within Test Units 1 and 4, materials found in the majority of the excavated levels are indicative of a series of stratified occupations and frequent overbank flooding with peaks in recovery at 80–130 cm in Test Unit 1 and 50–70 cm in Test Unit 4. In contrast, the overwhelming majority of materials in Test Units 3 and 5 were found in association with burned rock features at depths of 140–170 cm and 50–70 cm, respectively.

Cultural Features

Three burned rock features were identified in the deposits comprising Analysis Unit 2. Feature 2 is a hearth encountered at 86–95 cm in the northwest corner of Test Unit 1. The western portion of the feature was removed during the excavation of Backhoe Trench 12, and the northern part extends north of the test unit. Within Test Unit 1, the excavated portion of the feature measured 54 cm north-south by 48 cm east-west. It was composed of two tiers of large tabular and small angular burned rocks (n = 35, 13 kg), most of which were arranged in a circular, basin-shaped pattern (Figure 64). The larger tabular rocks were positioned on the outside edge of the feature, while the smaller fragmented pieces were mainly concentrated at the center. The largest of the tabular rocks measured 22x15x4 cm. All of the matrix within the feature was collected as charcoal and flotation samples. Seven heat-altered tertiary flakes, burned soil, and mussel shell fragments were observed. Charcoal from a flotation sample yielded a conventional radiocarbon age of 1560 ± 60 B.P. (see Appendix A). Cultural materials found at the same level as the feature include 38 flakes, 24 bone fragments, 17 mussel shells, 120 small scattered burned rocks, the untypeable dart point, a knife, a biface, and a scraper (all of which were recovered at 80–100 cm).

Feature 3 was encountered at 147–162 cm in the western portion of Test Unit 3. The western half of the feature had been removed during trenching; the excavated eastern half of the hearth was composed of 24 subangular pieces of fire-cracked limestone (3.25 kg) tightly clustered in a semicircular (54x28 cm), basin-shaped arrangement (Figure 65). The hearth was composed of no more than two tiers of rocks, with the rocks ranging from 5 to 12 cm in maximum length. Some of the rocks appeared to have been fractured in situ as a result of intense burning. Charcoal and oxidized sediment were observed within the feature fill, and charcoal recovered from a flotation sample yielded a radiocarbon age of 2440 ± 60 B.P. (see Appendix A). Associated artifacts found in the surrounding matrix include several small scattered burned rocks and a single flake.

A dense cluster of burned rocks, designated as Feature 5, was encountered at 46–62 cm in Test Unit 5 (Figure 66). The southern edge of the feature was destroyed during trenching, but the excavated portion measured 94 cm east-west by 76 cm north-south and was no more than two tiers of rock in thickness. The feature was composed of 67 burned rocks (13.5 kg), of which 17

Table 21. Artifacts recovered from Analysis Unit 2, 41CV1579

Artifacts	Test Unit 1	Test Unit 3	Test Unit 4	Test Unit 5	Totals
Dart point	1	0	0	0	1
Knives	2	0	3	1	6
Scrapers	2	0	0	0	2
Miscellaneous biface	1	0	0	0	1
Unmodified debitage	233	1	49	4	287
Ground stone	1	0	0	0	1
Totals	240	1	52	5	298

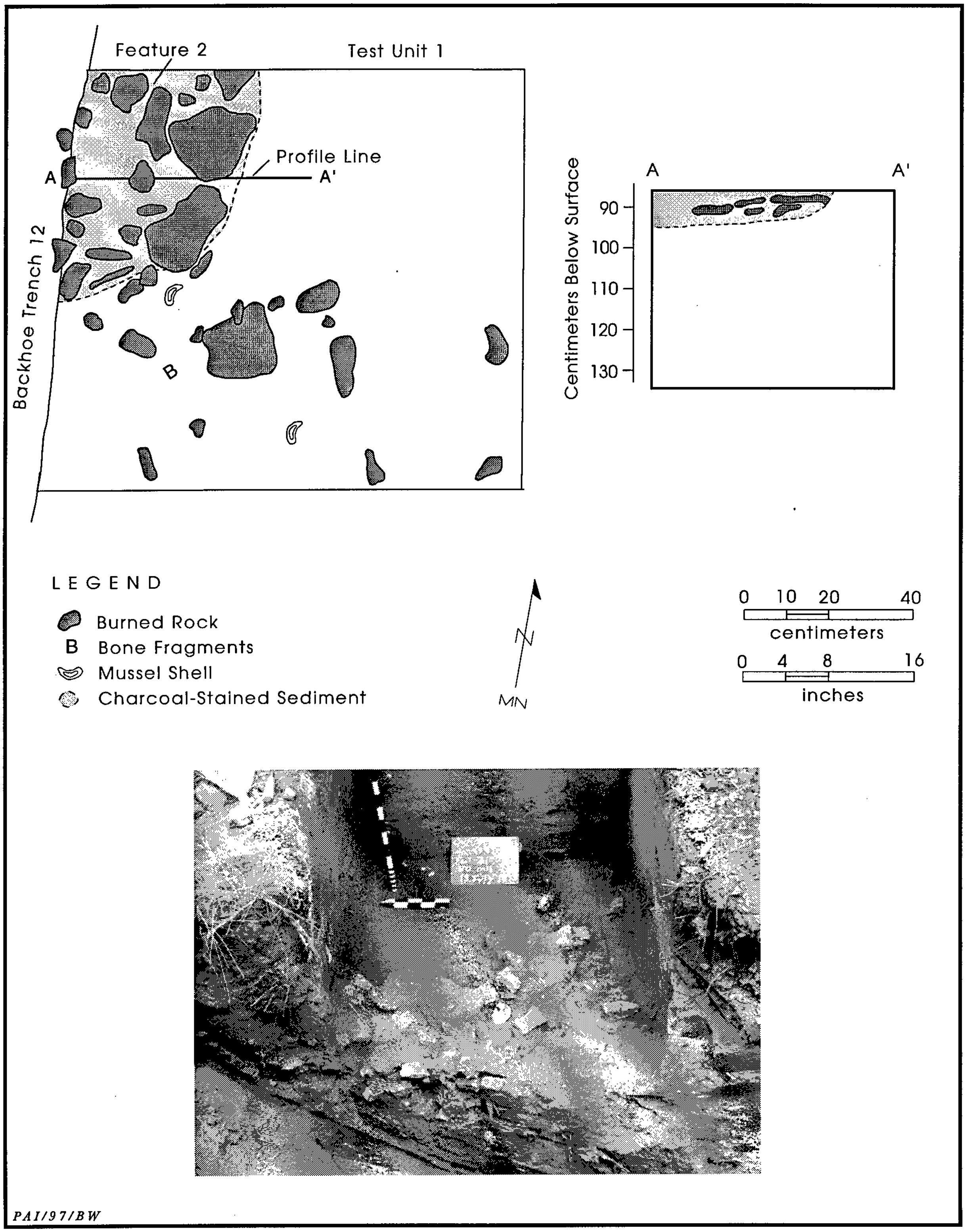

Figure 64. Photograph, plan, and profile of Feature 2 in Test Unit 1, 41CV1549. Plan view shows burned rocks and artifacts at 85–93 cm.

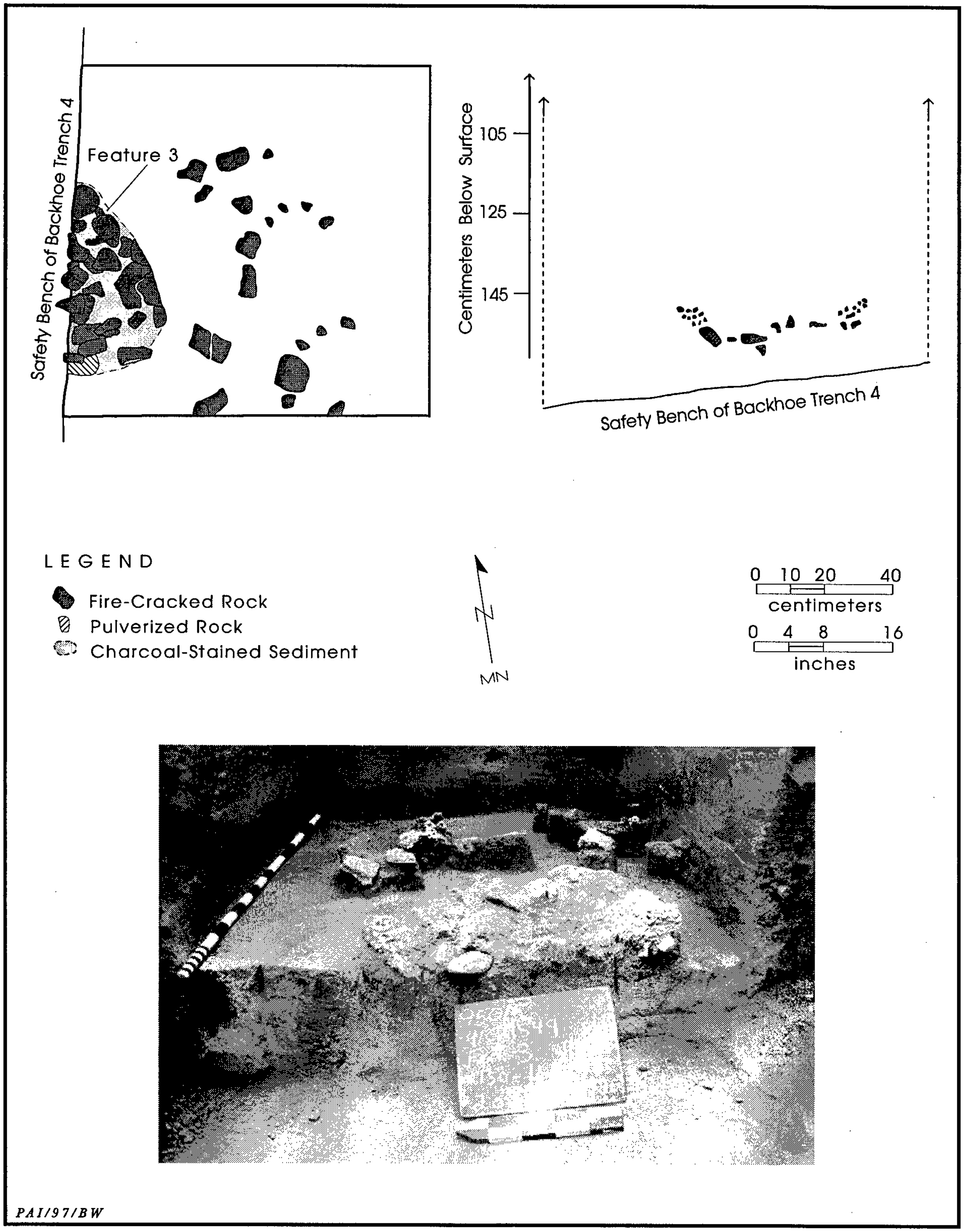

Figure 65. Photograph, plan, and profile (along east wall of Backhoe Trench 4) of Feature 3 in Test Unit 3, 41CV1549. Plan view shows burned rocks at 148–162 cm.

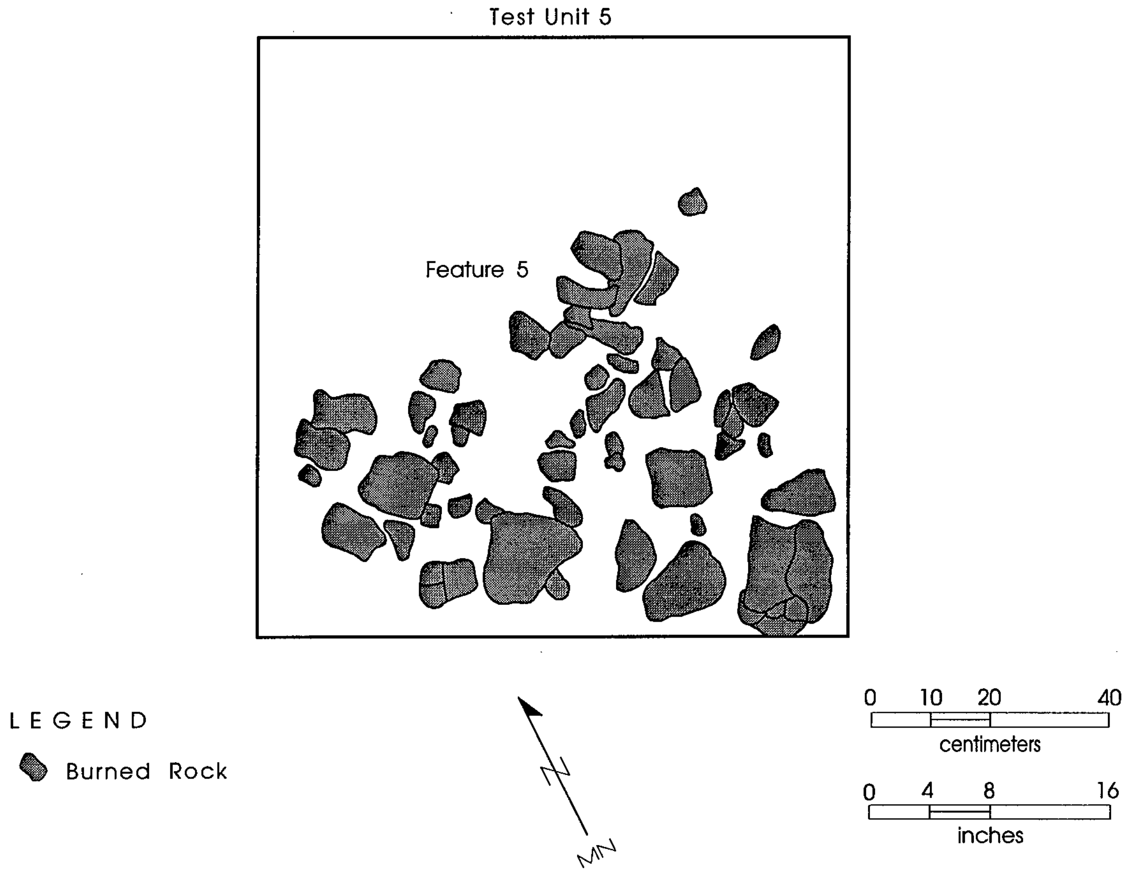

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Figure 66. Photograph and plan of Feature 5 in Test Unit 5, 41CV1549.

were tabular and 50 were subangular. Although no evidence of a pit was recognized, the tabular rocks mainly occurred at the outer edge of the feature and sloped slightly toward the center, while the subangular rocks were more concentrated at the inner area of the feature. Although no bones, shells, lithic artifacts, or charcoal were observed within the fill, four flakes and a knife fragment were found outside the feature at 50–70 cm.

Discussion

Cultural remains were dated by radiocarbon assays on charcoal associated with two cultural features buried relatively deep in Analysis Unit 2. These assays span the period from 761 B.C. to A.D. 596. Although distanced from one another spatially, they appear to be in correct stratigraphic order, with the older assay (calibrated range 761–403 B.C.) associated with Feature 3 at 150–162 cm and the more recent assay (calibrated range A.D. 427–596) associated with Feature 2 at 88–95 cm. These radiocarbon dates indicate that Analysis Unit 2 was occupied at various times during the latter part of the Late Archaic period. Test Unit 1 revealed a series of stratified cultural occupations in which an intact hearth (Feature 2) with associated charcoal, lithics, and ecofacts was identified. An isolated intact hearth (Feature 3) was located in Test Unit 3. Although few organics were found in Test Units 4 and 5, the depth, sediment texture, and soil horizon at which a peak cultural material frequency occurs in Test Unit 4 matches that of Feature 5 in Test Unit 5. This evidence suggests that a fairly extensive and stratigraphically discrete occupation is present in this portion of the site. Thus, 41CV1549 contains stratified Late Archaic assemblages with intact features, and although the occupations appear to be widely distributed across the site, they can potentially provide valuable information about hunter-gatherer adaptive strategies along the Cowhouse Creek drainage.

ANALYSIS OF MATERIALS RECOVERED

Steve A. Tomka and Karl Kleinbach

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This chapter discusses all of the materials recovered from the 19 sites investigated. Although the size of the collections from specific sites varies significantly (Table 22), a total of 18,406 artifacts is represented. Most of the items are chipped lithics, with other items occurring in small frequencies. Throughout this chapter, artifacts are discussed by morphological/functional groups defined in Chapter 4. For tabular presentation of artifact data, artifact provenience is by site and analysis unit as defined in Chapters 5 and 6.

CHIPPED STONE ARTIFACTS

Large samples obtained from sites 41BL155 (n = 6,687), 41BL181 (n = 3,149), 41CV1473 (n = 2,217), and 41BL827 (n = 2,151) account for 77.3 percent of all chipped lithics (Table 23). Moderate samples (ranging from 300 to 1,044 specimens per site) obtained from 41BL69, 41BL667, 41CV722, 41CV944, 41CV1482, and 41CV1549 account for 20.6 percent (n = 3,783) of the chipped stones. The remaining 2.1 percent of the chipped lithic assemblage is comprised of small and very small samples from 41BL579, 41BL581, 41BL582, 41BL816, 41CV1348, 41CV1478, 41CV1479, 41CV1480, and 41CV1487 (ranging from 1 to 183 specimens each).

The single largest artifact category in the assemblage is unmodified debitage, comprising 96.3 percent (n = 17,712) of the chipped stones. Scrapers, miscellaneous unifaces, projectile points, miscellaneous bifaces, and knives are the most abundant chipped stone tools and comprise 3.1 percent (n = 564) of the total chipped lithics. All other categories of chipped stone tools combined make up only 0.6 percent (n = 106) of the assemblage.

The chert typology used for the analysis of chipped stone artifacts here and in Chapter 8 follows previous work by Dickens (1993a, 1993b), Frederick and Ringstaff (1994), and Abbott and Trierweiler (1995b). The chert types (defined in Appendix E) and their abbreviations are summarized in Table 24.

Arrow Points

Of the 47 arrow points in the collection, only 8 (17.0 percent) are complete. Eighteen (38.3 percent) are proximal fragments, 9 (19.1 percent) are medial fragments, 11 (23.4 percent) are distal fragments, and 1 (2.1 percent) is a longitudinal specimen. All of the arrow points are made of fine-grained chert; 24 (51.1 percent) match types in the currently defined Fort Hood chert typology. The remaining 23 (48.9 percent) are made of cherts categorized into five indeterminate color (chert type) groups. Thirteen (27.7 percent) arrow points are typed specimens, 3 each (6.4 percent) are typed and untyped preforms, 1 (2.1 percent) is an untyped specimen, 13 (27.7 percent) are untypeable fragments, and 14 (29.8 percent) are arrow point blanks (Table 25). Metric attributes by arrow point type and/or untyped group are presented in Table 26.

Bonham

Morphology: Bonham arrow points have short parallel stems with straight to convex bases. Blades vary from moderately long to very long and broad; blade edges vary from straight to slightly concave and are sometimes serrated; the points are strongly shouldered (Figure 67*a*, *b*).
Number of Specimens: 2.
Raw Material: Type 6 (HLT) and Type 8 (FHY).

Table 22. Summary of artifacts recovered from all sites[1]

Site	Chipped stone tools	Unmodified debitage[2]	Ground/battered stone tools	Modified bones	Modified shells	Totals[3]
41BL69	15	679	3	–	3	700
41BL155	309	6,354 (24)	3	–	–	6,690
41BL181	68	3,081	–	–	–	3,149
41BL579	2	34	–	–	–	36
41BL581	1	1	–	–	–	2
41BL582	7	176	2	–	–	185
41BL667	31	733	–	–	–	764
41BL816	1	38	–	–	–	39
41BL827	50	2,093 (8)	5	–	–	2,156
41CV722	42	571	–	–	–	613
41CV944	30	1,013 (1)	–	–	–	1,044
41CV1348	–	1	–	–	–	1
41CV1473	68	2,149	–	–	–	2,217
41CV1478	9	79	–	2	3	93
41CV1479	4	31	–	1	–	36
41CV1480	–	2	–	–	–	2
41CV1482	22	278	–	–	1	301
41CV1487	–	9	–	–	–	9
41CV1549	11	357	1	–	–	369
Totals	670	17,679 (33)	14	3	7	18,406

[1]Excludes burned rocks, unmodified bones and shells, and bones and shells with unintentional cultural modifications (burning, butcher marks, etc.).
[2]Due to coding errors, 33 of the unmodified debitage specimens shown here were deleted from the database for subsequent analysis. Deleted specimens are shown in parentheses.
[3]Includes debitage specimens deleted from subsequent analyses. Total number of specimens excluding 33 unanalyzed pieces of debitage is 18,373.

Tool Completeness: 1 complete specimen with a broken shoulder; 1 proximal fragment with both shoulders missing.
Break Type: 1 specimen broken in use.

Bonham, Preform

Morphology: These are preforms for parallel stemmed points with broad, heavily shouldered blades and straight to slightly convex bases; blade edges are straight to slightly concave. One of the specimens was discarded due to a break initiated midway on the blade and running tangentially to the longitudinal axis; the second specimen is complete but exhibits numerous manufacture difficulties including missing barbs and a very narrow blade (Figure 67*c, d*).
Number of Specimens: 2.
Raw Material: Type 8 (FHY) and Type 34 (indeterminate light brown).
Tool Completeness: 1 complete; 1 proximal fragment.
Break Type: 1 manufacture broken; 1 complete manufacture discard.

Cliffton, Preform

Morphology: The Cliffton preform has a short contracting stem with a pointed base. The blade edges vary from slightly convex to slightly concave, and the point is moderately shouldered and bifacially flaked only at the stem and the distal portion of the blade (Figure 67*e*).
Number of Specimens: 1.
Raw Material: Type 8 (FHY).
Tool Completeness: Complete with a broken shoulder.

Fresno

Morphology: Fresno is a triangular unnotched arrow point with a slightly convex base; blade edges are straight, and base and stem corners are sharply defined (Figure 67*f*).

Table 23. Summary of chipped lithic artifacts by site

Site	Projectile points	Perforators	Adzes	Gouge	Knives	Scrapers	Choppers	Gravers	Multifunctional tools	Miscellaneous bifaces	Miscellansoues unifaces	Cores	Unmodified debitage[1]	Totals[2]
41BL69	1	2	2	–	–	4	–	–	–	6	–	–	679	694
41BL155	28	4	14	–	34	90	6	5	3	38	77	10	6,354 (24)	6,687
41BL181	7	1	7	–	8	16	3	3	1	6	12	4	3,081	3,149
41BL579	1	–	–	–	–	–	–	–	–	–	1	–	34	36
41BL581	–	–	–	–	–	1	–	–	–	–	–	–	1	2
41BL582	3	–	1	–	–	1	1	–	–	–	1	–	176	183
41BL667	14	–	1	–	3	2	–	1	–	3	1	6	733	764
41BL816	1	–	–	–	–	–	–	–	–	–	–	–	38	39
41BL827	14	1	1	–	2	11	–	–	–	5	13	3	2,093 (8)	2,151
41CV722	14	–	–	–	1	13	3	1	–	6	1	3	571	613
41CV944	10	–	–	–	2	6	–	1	–	3	6	2	1,013 (1)	1,044
41CV1348	–	–	–	–	–	–	–	–	–	–	–	–	1	1
41CV1473	4	–	–	1	14	18	–	2	1	7	14	7	2,149	2,217
41CV1478	–	1	–	–	–	6	–	–	–	–	1	1	79	88
41CV1479	2	–	–	–	–	1	–	–	–	1	–	–	31	35
41CV1480	–	–	–	–	–	–	–	–	–	–	–	–	2	2
41CV1482	4	1	–	–	1	5	1	–	–	4	5	1	278	300
41CV1487	–	–	–	–	–	–	–	–	–	–	–	–	9	9
41CV1549	1	–	–	–	7	2	–	–	–	1	–	–	357	368
Totals	104	10	26	1	72	176	14	13	5	80	132	37	17,679 (33)	18,382

[1]Thirty-three unmodified debitage specimens were deleted from the database due to coding errors. Deleted specimens are shown in parentheses.
[2]Totals include unmodified debitage deleted from subsequent analysis.

Number of Specimens: 1.
Raw Material: Type 33 (indeterminate dark gray).
Tool Completeness: Proximal fragment.
Break Type: Use broken.

Granbury

Morphology: Granbury points are medium to large triangular points with no notches. Blade edges are straight to convex and bases are moderately convex; workmanship ranges from fully bifacially flaked to primarily unifacially flaked, suggesting that some specimens lumped into the type might actually represent preforms for any number of triangular arrow points rather than a finished type (Figure 67*g, h*).
Number of Specimens: 2.
Raw Material: Type 2 (CW) and Type 8 (FHY).
Tool Completeness: 1 complete specimen; 1 proximal fragment.
Break Type: 1 indeterminate break cause.

Perdiz

Morphology: Perdiz is a small triangular point with parallel stems and a rounded to pointed base. Blade edges vary from straight to concave, and the blade exhibits slightly downward- and moderately outward-pointing barbs (Figure 67*i*).
Number of Specimens: 1.
Raw Material: Type 35 (indeterminate dark brown).
Tool Completeness: Proximal fragment with one missing shoulder.
Break Type: Indeterminate break cause.

Scallorn

Morphology: Scallorn points are small to medium-sized triangular points with narrow to relatively broad blades and strongly expanding stems that are often as wide as the shoulders. Blade edges tend to be straight, although convex and concave outlines are also present. Blade

Table 24. Chert typology used for chipped stone artifact analysis

Type number	Name	Abbreviation
1	Heiner Lake Blue-Light	HLB-LT
2	Cowhouse White	CW
3	Anderson Mountain Gray	AMG
4	Seven Mile Mountain Novaculite	SMN
5	Texas Novaculite	TN
6	Heiner Lake Tan	HLT
7	Fossiliferous Pale Brown	FPB
8	Fort Hood Yellow	FHY
9	Heiner Lake Translucent Brown	HLTB
10	Heiner Lake Blue	HLB
11	East Range Flat	ERF
12	not assigned	–
13	East Range Flecked	ER Flecked
14	Fort Hood Gray	FHG
15	Gray-Brown-Green	GBG
16	Leona Park	LP
17	Owl Creek Black	OCB
18	Cowhouse Two Tone	CTT
19	Cowhouse Dark Gray	CDG
20	Cowhouse Shell Hash	CSH
21	Cowhouse Light Gray	CLG
22	Cowhouse Mottled with Flecks	CMF
23	Cowhouse Banded and Mottled	CBM
24	Cowhouse Fossiliferous Light Brown	CFLB
25	Cowhouse Brown Flecked	CBF
26	Cowhouse Streaked	CS
27	Cowhouse Novaculite	CN
28	Table Rock Flat	TRF
29–38	indeterminate types*	–

*Indeterminate chert types are defined by their primary color as white, yellow, mottled, light gray, dark gray, light brown, dark brown, black, blue, and red.

edges terminate in long, sharply pointed barbs; necks are narrow, while the stem is strongly expanding and gives the specimens an almost side-notched appearance (Figure 67*j*).
Number of Specimens: 7.
Raw Material: 4 Type 8 (FHY), 1 Type 32 (indeterminate light gray), 1 Type 34 (indeterminate light brown), and 1 Type 35 (indeterminate dark brown).
Tool Completeness: 7 proximal fragments.
Break Type: 4 specimens have use-related breaks; 3 have indeterminate breaks.

Untyped Bulbar Stemmed

Morphology: The untyped bulbar stemmed arrow point is small and triangular, with serrated blade edges that terminate in moderate downward-pointing sharp barbs. The stem has parallel sides adjacent to the neck and a distinctively bulbar appearance in the vicinity of the base; the straight blade edges are irregularly serrated and the tip is flaked to a sharp point (Figure 67*k*).
Number of Specimens: 1.
Raw Material: Type 8 (FHY).
Tool Completeness: Complete with a broken barb.

Untyped Expanding Stem with Convex Base, Preform

Morphology: This type is a small, corner-notched triangular point made on a bladelet. Only one edge of the stem has been shaped, and the intended barb was broken in manufacture. With the exception of the stem and a portion of the base, which are bifacially flaked, the point is primarily unifacially flaked; its base is slightly convex with a slight indentation suggesting that some attempt was made to prepare the base for the second notch on the opposite edge of the stem. With a similarly notched opposite stem margin, the specimen would resemble a Scallorn point. However, given that its manufacture had not advanced to this stage and it was made on a bladelet, a blank form that was not often employed in Scallorn manufacture, the specimen is treated as a generalized preform rather than a Scallorn preform specifically (Figure 67*l*).
Number of Specimens: 1.
Raw Material: Type 8 (FHY).
Tool Completeness: Complete specimen.

Untyped Contracting Stem with Pointed Base, Preform

Morphology: This preform is a rectangular flake

Table 25. Breakdown of arrow points by site, analysis unit, and type

Arrow points	41BL69 (Shelter A)	41BL181	41BL579 (Shelter B)	41BL667	41BL827	41CV722 (AU 1)	41CV722 (AU 2)	41CV722 (AU 3)	41CV944 (Shelter A)	41CV1473	41CV1479 (AU 2)	41CV1482 (AU 2)	Totals
Bonham	–	–	–	–	–	1	1	–	–	–	–	–	2
Bonham, preform	–	–	–	–	1	–	–	–	1	–	–	–	2
Cliffton, preform	–	–	–	–	–	1	–	–	–	–	–	–	1
Fresno	–	–	–	1	–	–	–	–	–	–	–	–	1
Granbury	–	–	–	–	1	–	–	–	1	–	–	–	2
Perdiz	–	–	–	–	–	–	–	–	1	–	–	–	1
Scallorn	–	1	–	3	–	–	–	–	2	–	1	–	7
Untyped bulbar stemmed	–	–	–	–	–	–	–	–	–	–	–	1	1
Untyped contracting stem with pointed base	–	–	–	1	–	–	–	–	–	–	–	–	1
Untyped expanding stem with convex base, preform	–	–	–	–	–	–	–	–	1	–	–	–	1
Untyped parallel stem with straight base, preform	–	–	–	–	1	–	–	–	–	–	–	–	1
Untypeable fragments	1	1	1	3	3	1	–	–	–	2	1	–	13
Arrow point blanks	–	1	–	2	5	3	–	1	2	–	–	–	14
Totals	1	3	1	10	11	6	1	1	8	2	2	1	47

blank with serrated blade edges lacking flake scars on the interior of the body. The stem is short, contracting, and formed through minimal retouch; given its minimally retouched appearance and the presence of purposeful serrations, even along the distal end, it is possible that the specimen was intended as a small hafted knife. However, since no use wear was detected along the edges, haft wear is lacking along the proximal end, and the stem resembles Cliffton arrow point stems, it is categorized as a preform rather than a knife (Figure 67*m*).
Number of Specimens: 1.
Raw Material: Type 8 (FHY).
Tool Completeness: Complete.
Blade Treatment: Serrated edges.

Untyped Parallel Stem with Straight Base, Preform

Morphology: This preform is a medium-sized triangular point with a broad, heavily shouldered blade. The blade and stem are shaped by minimal marginal retouch along the flake blanks' ventral and dorsal faces. Blade edges are slightly concave and the stem is short, square, and broad (Figure 67*n*).
Number of Specimens: 1.
Raw Material: Type 29 (indeterminate white).
Tool Completeness: Proximal fragment.
Break Type: Manufacture broken.

Untypeable Fragments

Morphology: Arrow point proximal, medial, and distal fragments that cannot be placed into typological or descriptive groups but appear to have been functional specimens prior to discard are classified as untypeable fragments.
Number of Specimens: 13.
Raw Material: 2 Type 8 (FHY), 1 Type 9 (HLTB), 4 Type 29 (indeterminate white), 3 Type 34 (indeterminate light brown), 2 Type 32 (indeterminate light gray), and 1 Type 33 (indeterminate dark gray).
Tool Completeness: 1 proximal fragment; 8 medial fragments; 4 distal fragments.
Break Type: 11 broken in use; 2 indeterminate break cause.
Blade Treatment: 3 serrated; 1 indeterminate; 9

Table 26. Arrow point metric attributes

Arrow Point	Overall length	Blade length	Blade width	Stem length	Neck width	Base width	Thickness	Weight
Bonham (n = 2)	n = 1 35.0	n = 1 26.0	–	n = 2 min = 8 max = 9	n = 2 min = 5 max = 6	n = 2 min = 5 max = 5	n = 2 min = 3 max = 4	n = 1 1.1
Bonham, preform (n = 2)	n = 1 24.0	n = 1 16.0	–	n = 2 min = 8 max = 8	n = 2 min = 5 max = 5	n = 2 min = 5 max = 5	n = 2 min = 3 max = 4	n = 1 0.7
Cliffton, preform (n = 1)	28	25	15	3	6	2	3	1.1
Fresno (n = 1)	–	–	13	10	13	17	5	–
Granbury (n = 2)	n = 1 35.0	n = 1 23.0	n = 2 min = 18 max = 21	n = 2 min = 12 max = 16	n = 2 min = 18 max = 21	n = 2 min = 18 max = 20	n = 2 min = 4 max = 6	n = 1 2.8
Perdiz (n = 1)	–	–	–	8	5	5	3	–
Scallorn (n = 7)	–	–	–	n = 7 x̄ = 6.4 σ = 1.3 min = 4 max = 8	n = 7 x̄ = 5.7 σ = 1.1 min = 4 max = 7	n = 2 – – min = 10 max = 12	n = 7 x̄ = 3.8 σ = 0.7 min = 3 max = 5	–
Untyped bulbar stemmed (n = 1)	26	20	–	6	5	6	4	1.0
Untyped expanding stem with convex base, preform (n = 1)	20	16	–	4	9	10	3	0.6
Untyped contracting stem with pointed base, preform (n = 1)	26	23	15	3	3	2	4	1.8
Untyped parallel stem with straight base, preform (n = 1)	–	–	–	6	8	8	5	–
Untypeable fragments (n = 13)	–	n = 2 – – min = 20 max = 24	n = 4 x̄ = 16.5 σ = 1.9 min = 14 max = 18	n = 1 7.0	n = 7 x̄ = 6.6 σ = 1.8 min = 5 max = 10	–	n = 13 x̄ = 3.3 σ = 0.6 min = 2 max = 4	–
Arrow point blanks (n = 14)	n = 1 39.0	n = 2 – – min = 22 max = 31	n = 3 x̄ = 21.3 σ = 4.0 min = 19 max = 26	n = 2 – – min = 10 max = 17	n = 3 x̄ = 20.7 σ = 4.7 min = 17 max = 26	n = 4 x̄ = 18.3 σ = 4.7 min = 15 max = 25	n = 14 x̄ = 4.6 σ = 3.7 min = 2 max = 17	n = 2 – – min = 3.0 max = 5.9

NOTE: Measurements are in millimeters, weight is in grams.

without modification.

Arrow Point Blanks

Morphology: Complete arrow points and proximal, medial, distal, and longitudinal fragments that represent unfinished specimens as determined based on break cause and/or the roughness of the flaking when intact are classed as arrow point blanks.

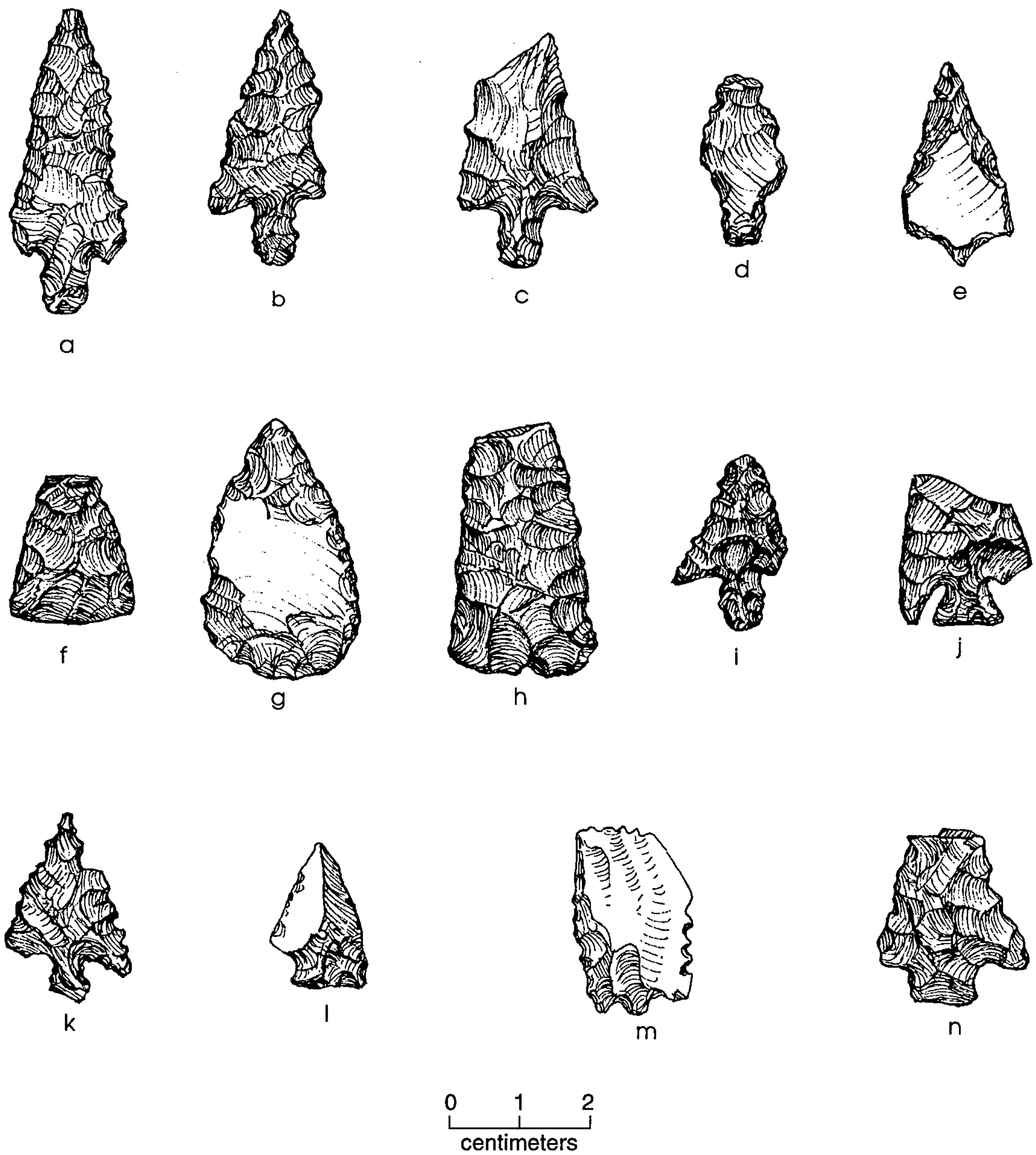

Figure 67. Arrow points. (*a–b*) Bonham (41CV722); (*c*) Bonham preform (41BL827); (*d*) Bonham preform (41CV944); (*e*) Cliffton preform (41CV722); (*f*) Fresno (41BL667); (*g*) Granbury (41CV944); (*h*) Granbury (41BL827); (*i*) Perdiz (41CV944); (*j*) Scallorn (41BL667); (*k*) untyped bulbar stemmed (41CV1482); (*l*) untyped expanding stem with convex base, preform (41CV944); (*m*) untyped contracting stem with pointed base, preform (41BL667); (*n*) untyped parallel stem with straight base, preform (41BL827).

Number of Specimens: 14.
Raw Material: 2 Type 6 (HLT), 2 Type 8 (FHY), 1 Type 2 (CW), 1 Type 10 (HLB), 1 Type 14 (FHG), 1 Type 17 (OCB), 3 Type 34 (indeterminate light brown), 2 Type 35 (indeterminate dark brown), and 1 Type 33 (indeterminate dark gray).
Tool Completeness: 1 complete; 7 distal fragments; 4 proximal fragments; 1 medial fragment; 1 longitudinal fragment.
Break Type: 10 manufacture broken; 3 indeterminate break cause.
Blade Treatment: 2 serrated; 12 without modification.

Dart Points

Of the 57 dart points in the collection, 7 (12.3 percent) are complete, 31 (54.4 percent) are proximal and/or stem fragments, 13 (22.8 percent) are medial fragments, 3 (5.3 percent) are distal fragments, and 1 (1.8 percent) each is a longitudinal fragment, a barb, and a dart point wedge fragment. All are made of fine-grained chert. Thirty-nine (68.4 percent) are typed and 18 (31.6 percent) are untypeable fragments (Table 27). Darl (n = 9, 23.1 percent) and Ensor (n = 7, 17.9 percent) are the two most common typed dart points, followed by Pedernales (n = 6, 15.4 percent) and Zephyr (n = 5, 12.8 percent). The remaining typed specimens consist of 3 each (7.7 percent) Castroville and Marshall, 2 each (5.1 percent) Frio and Montell, and 1 each (2.6 percent) Ellis and Marcos points. One of the Marshall points and one of the Pedernales specimens are preforms. Metric attributes by typed and/or untyped group are presented in Table 28.

Castroville

Morphology: Castroville are medium to large triangular points with straight to slightly convex blade edges that terminate in large downward-pointing barbs or strong shoulders when broken and reworked. The stems are broad, moderately expanding, and formed through basal notching (Figure 68*a*).
Number of Specimens: 3.
Raw Material: Type 9 (HLTB), Type 29 (indeterminate white), and Type 31 (indeterminate mottled).
Tool Completeness: 2 proximal fragments; 1 longitudinally broken point.
Break Type: 1 use broken; 1 postdepositionally broken; 1 indeterminate.
Blade Treatment—Serration: 2 indeterminate; 1 absent.
Blade Treatment—Beveling: 3 indeterminate.
Stem/Base Treatment—Grinding: 1 base only grinding; 2 absent.
Stem/Base Treatment—Beveling: 3 absent.

Darl

Morphology: Darls are medium-sized points with narrow blades and slight to moderately expanding stems and concave bases. Blade edges are straight to slightly convex and alternately beveled. Stem edges are also alternately beveled and often ground; bases tend to be moderately concave and are sometimes ground (Figure 68*b*, *c*).
Number of Specimens: 9.
Raw Material: 2 Type 8 (FHY), 1 Type 9 (HLTB), 1 Type 14 (FHG), 1 Type 17 (OCB), 1 Type 19 (CDG), 1 Type 32 (indeterminate light gray), 1 Type 34 (indeterminate light brown), and 1 Type 35 (indeterminate dark brown).
Tool Completeness: 8 proximal fragments; 1 nearly complete distal fragment.
Break Type: 5 use broken; 4 indeterminate break cause.
Blade Treatment—Serration: 3 serrated; 3 without modification; 3 indeterminate.
Blade Treatment—Beveling: 5 alternate right; 1 alternate left; 3 indeterminate.
Stem/Base Treatment—Grinding: 5 with stem only grinding; 3 grinding absent; 1 indeterminate.
Stem/Base Treatment—Beveling: 5 alternate left; 1 alternate right; 3 indeterminate.

Ellis

Morphology: Small points with straight, moderately shouldered, heavily reworked blade edges, slightly expanding stems, convex bases, and lacking any form of blade and stem treatment are classified as Ellis (Figure 68*d*).
Number of Specimens: 1.
Raw Material: Type 34 (indeterminate light brown).
Tool Completeness: Proximal fragment.
Break Type: Use broken.
Blade Treatment—Serration: Absent.
Blade Treatment—Beveling: Absent.
Stem/Base Treatment: Absent.

Ensor

Morphology: Ensor points are small to medium-sized triangular points with narrow to broad blades and highly expanding stems that are often as broad as the blades. The bases range from straight to very slightly convex; blade edges are straight and the stems and bases are rarely ground (Figure 68*e*, *f*).
Number of Specimens: 7.
Raw Material: 1 Type 6 (HLT), 1 Type 14 (FHG), 3 Type 34 (indeterminate light brown), 1 Type 32 (indeterminate light gray), and 1 Type 33 (indeterminate dark gray).

Table 27. Breakdown of dart point by site, analysis unit, and type

Site (Analysis Unit)	Castroville	Darl	Ellis	Ensor	Frio	Marcos	Marshall	Montell	Pedernales	Pedernales, preform	Zephyr	Indeterminate preform	Untypeable fragments	Totals
41BL155 (North Terrace)	3	4	–	4	1	–	1	2	5	1	1	1	5	28
41BL181	–	–	–	1	–	–	1	–	–	–	1	–	1	4
41BL582 (Shelter A)	–	1	–	–	–	–	–	–	–	–	–	–	2	3
41BL667	–	1	–	1	–	–	–	–	–	–	–	–	2	4
41BL816	–	–	–	–	–	–	–	–	–	–	–	–	1	1
41BL827	–	1	–	–	–	1	–	–	–	–	–	–	1	3
41CV722 (AU 1)	–	–	–	–	–	–	–	–	–	–	–	–	1	1
41CV722 (AU 2)	–	1	–	1	–	–	–	–	–	–	–	–	–	2
41CV722 (AU 3)	–	–	1	–	–	–	–	–	–	–	–	–	1	2
41CV722 (AU 4)	–	1	–	–	–	–	–	–	–	–	–	–	–	1
41CV944 (Shelter A)	–	–	–	–	–	–	–	–	–	–	–	–	2	2
41CV1473	–	–	–	–	–	–	–	–	–	–	1	–	1	2
41CV1482 (AU 2)	–	–	–	–	1	–	–	–	–	–	2	–	–	3
41CV1549 (AU 2)	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Totals	3	9	1	7	2	1	2	2	5	1	5	1	18	57

Table 28. Dart point metric attributes

Dart points	Overall length	Blade length	Blade width	Stem length	Neck width	Base width	Thickness	Weight
Castroville (n = 3)	–	–	–	n = 3 x̄ = 14.0 σ = 1.0 min = 13 max = 15	n = 2 – – min = 19 max = 23	n = 2 – – min = 25 max = 25	n = 3 x̄ = 8.7 σ = 0.6 min = 8 max = 9	–
Darl (n = 9)	–	n = 1 63.0	n = 6 x̄ = 17.3 σ = 2.6 min = 15 max = 21	n = 8 x̄ = 12.6 σ = 1.7 min = 11 max = 16	n = 9 x̄ = 14.0 σ = 1.1 min = 13 max = 16	n = 7 x̄ = 14.8 σ = 1.3 min = 13 max = 17	n = 9 x̄ = 6.1 σ = 0.8 min = 5 max = 7	–
Ellis (n = 1)	–	–	18.0	14.0	13.0	15.0	5.0	–
Ensor (n = 7)	n = 3 x̄ = 36.3 σ = 4.6 min = 31 max = 39	n = 3 x̄ = 27.3 σ = 5.5 min = 21 max = 31	n = 6 x̄ = 21.5 σ = 3.4 min = 18 max = 27	n = 6 x̄ = 9.3 σ = 0.8 min = 8 max = 10	n = 6 x̄ = 15.0 σ = 1.4 min = 13 max = 17	n = 3 x̄ = 22.7 σ = 2.1 min = 21 max = 25	n = 7 x̄ = 5.4 σ = 0.5 min = 5 max = 6	n = 3 x̄ = 3.0 σ = 0.5 min = 2.5 max = 3.4
Frio (n = 2)	n = 1 42.0	n = 1 34.0	n = 1 17.0	n = 2 min = 8 max = 9	n = 2 min = 14 max = 16	n = 2 min = 21 max = 25	n = 2 min = 5 max = 5	n = 1 2.6
Marcos (n = 1)	–	–	–	10.0	18.0	–	6.0	–
Marshall (n = 2)	n = 1 60.0	n = 1 48.0	n = 1 12.0	n = 2 min = 9 max = 17	n = 2 min = 14 max = 17	n = 2 min = 6 max = 17	n = 2 min = 7 max = 10	–
Montell (n = 2)	–	–	–	n = 1 14.0	–	–	n = 2 min = 7 max = 9	–
Pedernales (n = 5)	–	–	n = 4 x̄ = 29.7 σ = 5.5 min = 25 max = 37	n = 5 x̄ = 19.2 σ = 1.8 min = 17 max = 21	n = 5 x̄ = 16.4 σ = 1.3 min = 15 max = 18	n = 3 x̄ = 14.0 σ = 1.7 min = 12 max = 15	n = 5 x̄ = 8.0 σ = 0.7 min = 7 max = 9	–
Pedernales, preform (n = 1)	–	–	–	18	–	17	8	–
Zephyr (n = 5)	n = 1 53.0	n = 1 43.0	n = 4 x̄ = 24.3 σ = 3.3 min = 22 max = 29	n = 5 x̄ = 12.0 σ = 2.9 min = 10 max = 17	n = 5 x̄ = 14.8 σ = 1.6 min = 13 max = 17	n = 4 x̄ = 17.8 σ = 2.2 min = 15 max = 20	n = 5 x̄ = 6.6 σ = 0.9 min = 6 max = 8	n = 1 6.0
Indeterminate preform (n = 1)	72	64	46	8	22	21	14	38.1
Untypeable fragments (n = 18)	–	–	–	n = 1 18.0	n = 3 x̄ = 14.7 σ = 2.1 min = 13 max = 17	n = 2 – – min = 18 max = 19	n = 17 x̄ = 5.8 σ = 1.6 min = 3 max = 9	–

NOTE: Measurements are in millimeters, weight is in grams.

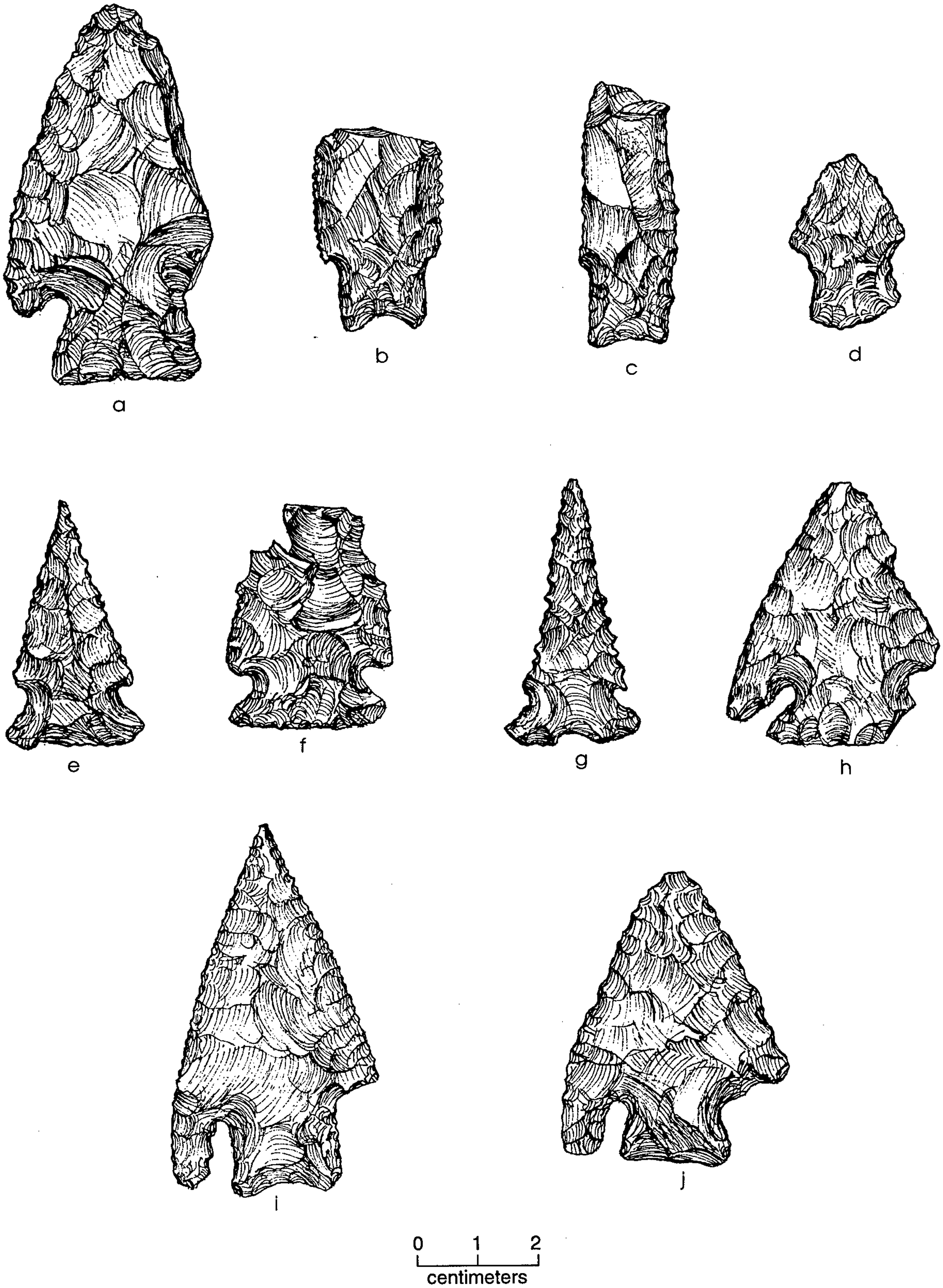

Figure 68. Dart points. (*a*) Castroville (41BL155); (*b*) Darl (41BL155); (*c*) Darl (41BL667); (*d*) Ellis (41CV722); (*e*) Ensor (41BL155); (*f*) Ensor (41CV722); (*g*) Frio (41BL155); (*h*) Marcos (41BL827); (*i*) Marshall (41BL155); (*j*) Marshall (41BL181).

Tool Completeness: 3 complete; 3 proximal fragments; 1 medial specimen.
Break Type: 3 use broken; 1 indeterminate break cause.
Blade Treatment—Serration: 1 serrated; 6 without modification.
Blade Treatment—Beveling: 3 alternate right; 1 indeterminate; 3 absent.
Stem/Base Treatment—Beveling: 2 indeterminate; 5 absent.
Stem/Base Treatment—Grinding: 1 indeterminate; 6 absent.

Frio

Morphology: Frio dart points are small to medium-sized triangular points with relatively narrow blades, expanding stems, and recurved bases. Blade edges are straight to slightly concave, finely serrated, and moderately shouldered; the corner-notched stems are slightly wider than the blades (Figure 68*g*).
Number of Specimens: 2.
Raw Material: 1 Type 32 (indeterminate light gray) and 1 Type 34 (indeterminate light brown).
Tool Completeness: 1 complete; 1 proximal fragment.
Break Type: 1 use broken.
Blade Treatment—Serration: 2 serrated.
Blade Treatment—Beveling: 2 absent.
Stem/Base Treatment—Beveling: 2 absent.
Stem/Base Treatment—Grinding: 2 absent.

Marcos

Morphology: A Marcos dart point is medium sized with convex blade edges, a strongly expanding stem, and long downward-pointing barbs. The stem has a moderately convex base and is basally thinned and wedge-shaped in longitudinal cross section (Figure 68*h*).
Number of Specimens: 1.
Raw Material: Type 34 (indeterminate light brown).
Tool Completeness: Proximal fragment with missing barb and ear.
Break Type: Use broken.
Blade Treatment—Serration: Absent.
Blade Treatment—Beveling: Absent.
Stem/Base Treatment: Absent.

Marshall

Morphology: Marshall dart points are medium sized and have highly convex blade edges, parallel to slightly expanding stems, and straight to moderately concave bases. The barbs are long and result from basal notching; the stems are relatively short (Figure 68*i, j*).
Number of Specimens: 2.
Raw Material: Type 10 (HLB) and Type 31 (indeterminate mottled).
Tool Completeness: 1 complete with one missing barb; 1 nearly complete proximal fragment with a missing barb.
Blade Treatment—Serration: 2 absent.
Blade Treatment—Beveling: 1 with a single left-beveled edge; 1 absent.
Stem/Base Treatment: 2 absent.

Montell

Morphology: A bifurcated stem fragment and a proximal point fragment missing half of the characteristic bifurcated stem are included in the Montell classification. The proximal fragment is characterized by a broad blade and a short, formerly bifurcate, corner-notched stem (Figure 69*a*).
Number of Specimens: 2.
Raw Material: Type 9 (HLTB) and Type 34 (indeterminate light brown).
Tool Completeness: 1 proximal fragment; 1 stem fragment.
Blade Treatment—Serration: 1 absent; 1 indeterminate.
Blade Treatment—Beveling: 1 absent; 1 indeterminate.
Stem/Base Treatment: 2 absent.

Pedernales

Morphology: Pedernales dart points are medium-sized to large points with broad, heavily shouldered blades, slightly contracting stems, and concave bases. Blade edges range from straight to slightly concave; the stems are relatively narrow and the ears are pointed (Figure 69*b*).
Number of Specimens: 5.
Raw Material: 4 Type 9 (HLTB) and 1 Type 10 (HLB).
Tool Completeness: 5 proximal fragments.
Break Type: 3 use broken; 2 indeterminate break cause.
Blade Treatment—Serration: 5 absent.
Blade Treatment—Beveling: 5 absent.
Stem/Base Treatment: 5 absent.

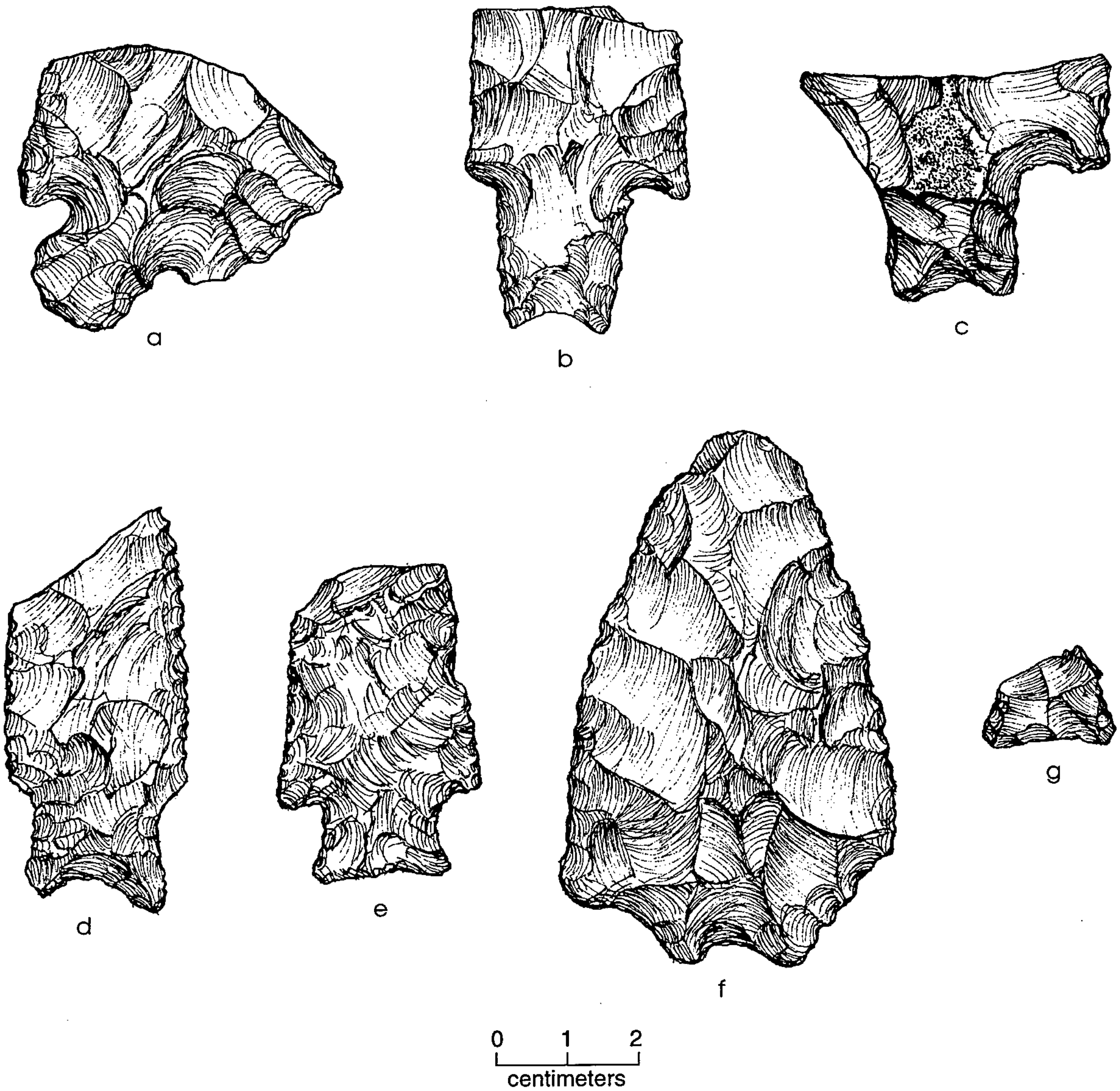

Figure 69. Dart points. (*a*) Montell (41BL155); (*b*) Pedernales (41BL155); (*c*) Pedernales, preform (41BL155); (*d*) Zephyr (41BL181); (*e*) Zephyr (41CV1473); (*f*) indeterminate, preform (41BL155); and (*g*) untypeable stem fragment (41BL155).

Pedernales, Preform

Morphology: This point is a large fragment with a broad blade and short barbs. The stem is slightly contracting and the base is concave. The stem is not as narrow as on the finished specimens, but the ears are pointed. Although the specimen is relatively thin and well flaked, it has a small portion of cortex on one face. The transverse blade break occurred during manufacture (Figure 69*c*).
Number of Specimens: 1.
Raw Material: Type 9 (HLTB).
Tool Completeness: Proximal fragment.
Break Type: Use broken, might also have been broken postdepositionally.
Blade Treatment—Serration: Indeterminate.
Blade Treatment—Beveling: Indeterminate.
Stem/Base Treatment: Absent.

Zephyr

Morphology: Dart points classified as Zephyrs

are medium sized with slightly convex blade edges, slightly to moderately expanding stems, and bases that vary from slightly to moderately concave. Blade edges tend to be alternately beveled, and the points are moderately to slightly shouldered; stems edges are often alternately beveled and ground (Figure 69*d, e*).
Number of Specimens: 5.
Raw Material: 3 Type 8 (FHY), 1 Type 32 (indeterminate light gray), and 1 Type 34 (indeterminate light brown).
Tool Completeness: 1 complete; 4 proximal fragments.
Blade Treatment—Serration: 3 serrated; 2 absent.
Blade Treatment—Beveling: 2 alternate left; 1 alternate right; 2 absent.
Stem/Base Treatment—Beveling: 3 alternate left; 2 absent.
Stem/Base Treatment—Grinding: 1 stem only ground; 1 base only ground; 3 absent.

Indeterminate, Preform

Morphology: This indeterminate preform is a large and relatively thick subtriangular biface with convex blade edges and a short, incompletely flaked stem with a concave base (Figure 69*f*). The specimen is somewhat reminiscent of Montell preforms from Jonas Terrace (Johnson 1995: Figures 76 and 77), although it lacks the bifurcated stem that should be better defined at this stage in the reduction.
Number of Specimens: 1.
Raw Material: Type 34 (indeterminate light brown).
Tool Completeness: Complete.
Blade Treatment—Serration: Absent.
Blade Treatment—Beveling: Absent.
Stem/Base Treatment: Absent.

Untypeable Fragments

Morphology: Dart point stem, medial, distal, and longitudinal fragments that cannot be placed into typological or descriptive groups but appear to have been functional specimens prior to discard are classed as untypeable fragments. The single stem fragment included in this group resembles Zephyr stems (Figure 69*g*); however, the fragment is too small to be included in this type group with certainty.
Number of Specimens: 18.
Raw Material: 3 Type 8 (FHY), 1 Type 10 (HLB), 1 Type 15 (GBG), 1 Type 17 (OCB), 1 Type 19 (CDG), 6 Type 34 (indeterminate light brown), 3 Type 35 (indeterminate dark brown), and 2 Type 33 (indeterminate dark gray).
Tool Completeness: 12 medial fragments; 2 stem fragments; 2 distal fragments; 1 longitudinal fragment; 1 wedge fragment.
Break Type: 10 use broken; 8 indeterminate break cause.
Blade Treatment—Serration: 1 serrated; 8 indeterminate; 9 absent.
Blade Treatment—Beveling: 2 alternate left; 9 indeterminate; 7 absent.
Base/Stem Treatment: 15 indeterminate; 3 absent.

Perforators

Ten perforators were recovered from the 19 sites. All are of fine-grained chert. The most common is chert Type 8 (FHY) with three specimens, followed by two each Type 6 (HLT) and Type 34 (indeterminate light brown), and one each Type 9 (HLTB), Type 13 (ER-flecked), and Type 31 (indeterminate mottled). Half (n = 5) are complete, 3 are proximal fragments, 1 is a distal fragment, and 1 is a medial specimen. Of the 5 incomplete specimens, 2 (40 percent) have use-related breaks, and break cause could not be determined on the remaining 3 (60 percent). In terms of functional subgroups, all but one (n = 9, 90 percent) are drills. The remaining specimen is so fragmentary that it cannot be assigned to a functional group. In terms of morphological subgroupings (Table 29), formal specimens (i.e., fully bifacially flaked [Figure 70*a*]) are infrequent (n = 2), while minimally retouched specimens, i.e., only partially bifacially flaked (Figure 70*b*) (n = 4) and expedient perforators (Figure 70*c*, n = 3) constitute the bulk of the specimens. The morphological subgroup could not be determined on one distal fragment. In terms of manufacture and/or use histories, 70 percent (n = 7) of the perforators are made on flakes. However, two specimens represent the recycling of nonperforator artifact types into perforators; one is a drill made on an Ensor dart point (Figure 70*d*), and the other is a drill made on a biface that might have been a dart point or knife preform (see Figure 70*a*). The nature of the blank could not be determined on one fully bifacially flaked distal fragment.

The overall length of the complete specimens

Table 29. Morphological subgroupings for perforators

Site, Analysis Unit	Formal	Miscellaneous Retouched	Expedient	Indeterminate	Totals
41BL69, Shelter A	1	–	–	1	2
41BL155, North Terrace	–	2	2	–	4
41BL181	–	1	–	–	1
41BL827	–	1	–	–	1
41CV1478, Analysis Unit 2	–	–	1	–	1
41CV1482, Analysis Unit 2	1	–	–	–	1
Totals	2	4	3	1	10

ranges from 30 to 52 mm (mean = 42.6 ± 9.2 mm, n = 5). Blade length ranges from 5 to 43 mm (mean = 22.4 ± 13.9 mm, n = 5). Maximum blade width ranges from 4 to 16 mm (mean = 8.3 ± 3.9 mm, n = 10). Haft length ranges from 7 to 34 mm (mean = 20.5 ± 10.4 mm, n = 8). Maximum haft/stem width ranges from 10 to 42 mm (mean = 22.3 ± 10.4 mm, n = 8). Maximum thickness ranges from 3 to 14 mm (mean = 6.7 ± 3.7 mm, n = 10). The Ensor dart point recycled into a drill has a maximum length of 50 mm, a blade measuring 43 mm, a 7-mm-long stem, a 15-mm maximum neck width, a 20-mm wide base, and a maximum thickness of 5 mm.

The presence of perforators indicates the performance of maintenance activities at the sites. The dominance of minimally retouched and expedient perforators suggests that these tools might have been involved in the performance of relatively light duty tasks where there was less likelihood of tool failure. This aspect of tool design could also be interpreted to reflect the possibility that the costs of manufacturing a minimally retouched perforator or selecting a suitable flake for an expedient perforator were sufficiently low that premature tool failures and their replacement would be less costly than the manufacture of formal variants with lower failure rates. A final aspect of the formal-minimally retouched-expedient tool continuum is that of tool reliability within the context of tool use. In general, in contexts where tool failure can be costly in terms of time invested in tool replacement, tools are designed to be reliable and less likely to fail when needed. In contexts where sufficient time is available to replace a failed tool without the user incurring costs other than those of tool replacement, tool design characteristics can be relaxed and reliability may be reduced. Within this interpretive framework, it is possible

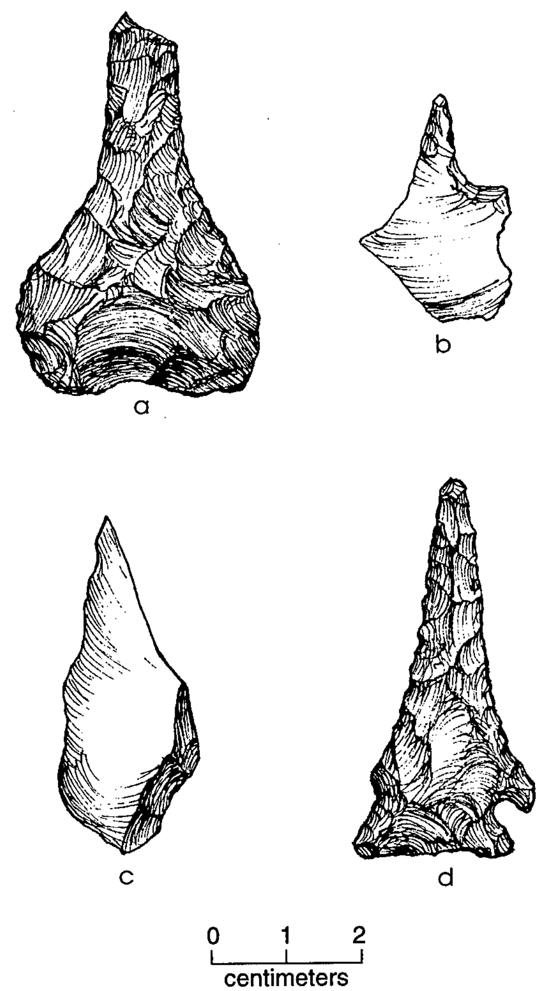

Figure 70. Perforators. (*a*) Formal perforator on biface (41BL69); (*b*) minimally retouched perforator (41BL827); (*c*) expedient perforator (41CV1478); (*d*) perforator on Ensor dart point (41CV1482).

to suggest that the scarcity of formal perforators and the dominance of minimally retouched and expedient specimens reflects a reduced need

for reliable tools.

Adzes

Twenty-six adzes were identified in the combined site samples. They are characterized by elongated and subtriangular bifacially flaked bodies with planoconvex to biconvex transverse cross sections and longitudinal curvatures. They have unifacially beveled working edges. All are made of fine-grained chert. Type 6 (HLT) is the most common (n = 8, 30.8 percent), followed by Type 31 (indeterminate mottled, n = 5, 19.2 percent). Type 8 (FHY), Type 15 (GBG), and Type 29 (indeterminate white) are represented by 2 specimens each (7.7 percent) and Type 9 (HLTB), Type 10 (HLB), Type 11 (ERF), Type 14 (FHG), Type 16 (LP), Type 32 (indeterminate light gray), and Type 34 (indeterminate light brown) each is represented by a single specimen (3.8 percent). Fully or nearly bifacially flaked adzes are more common (n = 21, 80.8 percent) than unifacially flaked variants (n = 5, 19.2 percent). Only 6 (23.1 percent) of the specimens could be identified as adzes made on flake blanks. The nature of the blanks used in the manufacture of the remaining 20 (76.9 percent) could not be identified due to the degree of bifacial retouch on their surfaces. Cortex is absent on 9 (34.6 percent) complete specimens, and patches of cortex can be noted on 11 (42.3 percent) complete and fragmentary tools. Cortex is absent on the remaining 6 (23.1 percent) fragmentary tools, but it cannot be established with certainty whether they retained any cortex in their complete state. The majority of the adzes are complete (n = 17, 65.4 percent), and 6 (23.1 percent) are distal fragments. Proximal (n = 2, 7.7 percent) and medial (n = 1, 3.8 percent) fragments are infrequent, in part because few unifacially and/or bifacially flaked tool fragments have sufficient morphological characteristics and haft/use wear to be securely placed into this functional category. Six of the nine fragments were broken in use, and the cause of breakage could not be determined on the remaining three.

The maximum length of the adzes ranges from 36 to 138 mm (mean = 83.4 ± 25.2 mm, n = 17). Their maximum width ranges from 19 to 82 mm (mean = 50.1 ± 14.4 mm, n = 25). Maximum thickness ranges from 5 to 37 mm (mean = 19.7 ± 6.9 mm, n = 26). The working edge angle also ranges widely, from 34 to 75° (mean = 55.3 ± 8.8°, n = 24).

Based on morphological characteristics, these tools can be divided into formal (n = 10, Figure 71*a, c*) and minimally retouched adzes (n = 16, Figure 71*b, d*) (Table 30). The specimens in the first group are subtriangular to ovate, fully bifacially flaked tools. The nature of the blanks employed cannot be determined due to the degree of flaking. Cortex is absent on the four complete specimens and one nearly complete distal fragment. The remaining tool fragments do not retain cortex in their present condition but this does not rule out the possibility that some might have had cortex in their complete state. Among the formal adzes, distal fragments (n = 5) are more common than complete specimens (n = 4); the other formal adze is a nearly complete proximal fragment. Of the six fragmentary specimens, three have breaks associated with use, while the cause of break could not be identified with certainty on the other three specimens. The formal adzes have a mean maximum length of 82.7 mm (σ = 2.1, n = 4), a mean maximum width of 42.8 mm (σ = 8.7, n = 9), and a mean maximum thickness of 17.3 mm (σ = 4.6, n = 10). The mean working edge angle of these specimens is 53.5° (σ = 6.2, n = 9).

Specimens in the minimally retouched group range from subtriangular to rectangular and in general are flaked less intensively (e.g., fewer flake removals) and less regularly (e.g., deep flake removal scars and pronounced flake scar ridges) than their formal counterparts. Six

Table 30. Morphological subgroupings for adzes

Site, Analysis Unit	Formal	Minimally retouched	Totals
41BL69, Shelter A	1	1	2
41BL155, North Terrace	3	10	13
41BL155, South Terrace	–	1	1
41BL181	4	3	7
41BL582, Shelter B	1	–	1
41BL667	–	1	1
41BL827	1	–	1
Totals	10	16	26

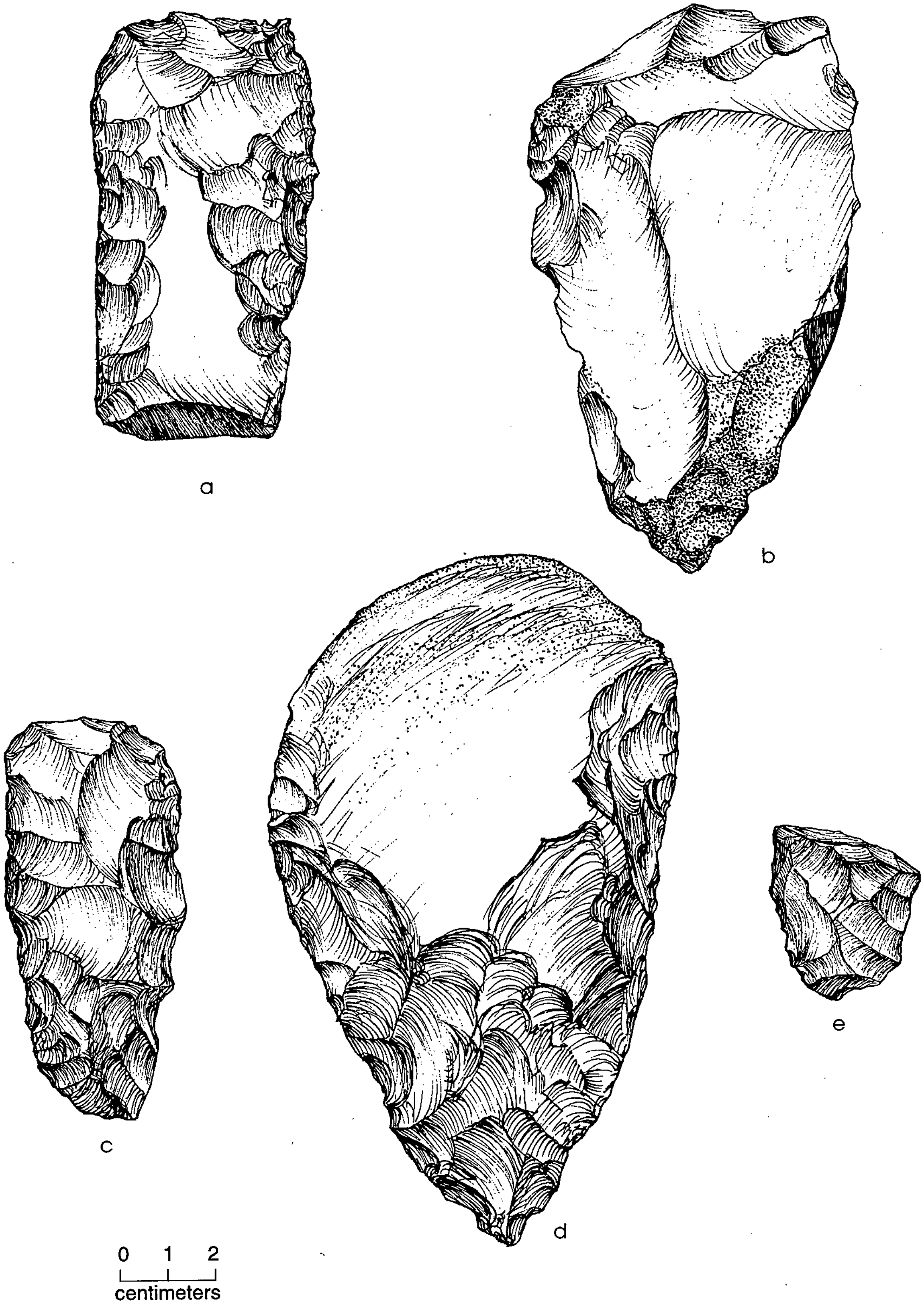

Figure 71. Adzes and gouge. (*a*) Elongated formal adze distal fragment (41BL181); (*b*) elongated minimally retouched subtriangular adze (41BL155); (*c*) formal adze (41BL155); (*d*) minimally retouched adze (41BL155); (*e*) gouge (41CV1473).

(37.5 percent) are made on flake blanks. The nature of the blanks cannot be determined on the remaining 10 (62.5 percent) specimens due to the degree of flaking. Cortex is absent on only 4 (25 percent) complete specimens, while 11 (68.8 percent) other complete tools and fragments retain some amount of cortex. The remaining tool fragment does not retain cortex in its present condition, although this does not rule out the possibility that it might have been corticate in its complete state. Among the minimally retouched adzes, complete tools are much more numerous (n = 13, 81.3 percent) than proximal, medial, and distal fragments, each of which is represented by a single specimen (6.3 percent). The three fragmentary specimens exhibit breaks associated with use. As a group, the minimally retouched adzes have a mean maximum length of 83.5 mm ($\sigma = 29.1$, n = 13), a mean maximum width of 54.2 mm ($\sigma = 15.6$, n = 16), and a mean maximum thickness of 21.3 mm ($\sigma = 7.8$, n = 16). The mean working edge angle is 56.3° ($\sigma = 10.1$, n = 15).

Based on the relative similarities in edge angles and maximum length between the formal and minimally retouched specimens, it is possible that they represent adzes used during the same stages in the manufacture process. Nonetheless, the smaller standard deviations noted in length, width, thickness, and working edge angle among the formal specimens indicate a greater degree of standardization during manufacture. Such a need might have been derived from hafting considerations, reflecting greater energy and time invested in the manufacture of these tools. The greater standardization also might imply a more consistent reliance upon or need for adzes within the overall technological sphere. Such a trend can be seen among end scrapers, where assemblages produced by groups that relied heavily on their use (e.g., Late Prehistoric Plains bison hunters) are much more formalized and standardized than their counterparts manufactured among groups that did not have periods of heavy reliance on them.

Gouge

A single gouge has been identified in the artifact samples. It is a triangular specimen (Figure 71*e*) made on a broken planoconvex bifacially flaked blank. Because it cannot be determined whether the bifacial artifact that served as a blank was also a gouge or whether the blank was recycled into a gouge, the tool is classified into an indeterminate morphological subgroup rather than either a formal or expedient subgroup.

The specimen is made of fine-grained Type 8 (FHY) chert. Cortex has been entirely removed from its faces, and the nature of the blank used in the manufacture of the original blank cannot be determined. The specimen is complete and measures 35 mm in length, 31 mm in maximum width, and 11 mm in maximum thickness. It has a relatively steep working edge angle of 81°.

Knives

Seventy-two knives have been identified in the artifact samples. All are made of fine-grained chert. Type 8 (FHY) specimens are the most common (n = 22, 30.6 percent), followed by Type 34 (indeterminate light brown, n = 12, 16.7 percent), Type 6 (HLT, n = 10, 13.9 percent), and Type 10 (HLB, n = 9, 12.5 percent). The remainder of the specimens consist of infrequent material types including the following: Type 31 (indeterminate mottled, n = 5, 6.9 percent); Type 15 (GBG, n = 4, 5.6 percent); Type 35 (indeterminate dark brown, n = 3, 4.2 percent); Type 9 (HLTB) and Type 32 (indeterminate light gray), each represented by 2 specimens (2.8 percent); and Type 2 (CW), Type 29 (indeterminate white), and Type 38 (indeterminate red), each with a single specimen (1.4 percent).

Thirty-one (43.1 percent) of the specimens could be identified as knives made on flake blanks. Eleven (15.3 percent) others are made on blade blanks, while the nature of the blanks used in the manufacture of the remaining 30 (41.7 percent) knives could not be identified due to the degree of bifacial retouch on their surfaces and/or the small size of the tool fragments. Cortex is absent on 23 (31.9 percent) complete knives, and patches of cortex can be noted on 21 (29.2 percent) complete and fragmentary tools. Cortex is absent on the remaining 28 (38.9 percent) fragmentary tools, but it is not certain whether they retained cortex in their complete state. Complete knives (n = 33) constitute a relatively large percentage (45.8 percent) of the specimens in the sample. However, proximal (n = 15, 20.8 percent), distal (n = 14, 19.4 percent), medial (n = 8, 11.1 percent), and indeterminate edge fragments (n = 2, 2.8 percent)

combined constitute the bulk of the knives (n = 39, 54.2 percent). Twenty-one (53.8 percent) of the 39 fragments were broken in use, and the cause of breakage could not be determined on the remaining 18 (46.2 percent).

The majority of the knives are expedient specimens (n = 41, 56.9 percent), followed by formal knives (n = 26, 36.1 percent), minimally retouched specimens (n = 4, 5.6 percent), and a single (1.4 percent) specimen with both expedient and minimally retouched edges (Table 31).

The formal knives range from triangular to ovate and somewhat lanceolate bifaces with use wear (Figure 72*a–c*). Fragmentary specimens grouped in this category were broken in use and/or exhibit use wear on their faces. Judging from their relative thinness and well-aligned edges, these bifaces represent late reduction stage and/or finished specimens. It is clear from these knives that, as used here, the stage of reduction does not necessarily correlate with whether a tool was employed in the performance of a particular task.

Twenty-five (96.2 percent) of the 26 formal knives have been bifacially retouched so fully that the nature of the blanks used in their manufacture cannot be determined. Only one specimen retains a very small portion of the parent flake blank's ventral surface. Cortex is absent on two of the three complete formal knives and is present on three other fragments. While cortex is absent on the remaining fragments (n = 20, 76.9 percent), this does not mean that they did not retain cortex in their complete state.

Only 3 (11.5 percent) of the 26 formal knives are complete. Distal fragments (n = 10, 38.5 percent), medial specimens (n = 7, 26.9 percent), and proximal fragments (n = 6, 23.1 percent) make up the rest of the knives (n = 23). Nineteen of the fragmentary formal knives (82.6 percent) have use-related breaks, while the cause of break could not be identified on the remaining 4 (17.4 percent) fragments. These knives range in maximum length from 49 to 70 mm (mean = 57.0 ± 11.4 mm, n = 3). Their maximum widths range from 18 to 52 mm (mean = 37.1 ± 10.5 mm, n = 3), and they range in maximum thickness from 5 to 14 mm (mean = 8.3 ± 2.0 mm, n = 26).

The four minimally retouched knives are flakes with either one or both lateral margins unifacially retouched through small hammerstone percussion or pressure flaking. Of the complete specimens, one is made on a secondary flake and the other, with a finely serrated distal edge (Figure 72*d*), is made on a tertiary flake blank. The two fragments do not retain cortex; however, it is impossible to infer whether they contained any cortex in their complete state. Two of the knives are complete specimens, one of the remaining tools is a proximal fragment, and the other is an edge fragment. Only one of the two fragments can be identified as use broken. Break cause cannot be identified on the edge fragment. The minimally retouched knives range in maximum length from 35 to 69 mm (mean = 44.0 ± 22.6 mm, n = 2). Their maximum widths range from 29 to 36 mm (mean = 32.5 ± 4.9 mm, n = 2), and they range in maximum thickness from 5 to 19 mm

Table 31. Morphological subgroupings for knives

Site, Analysis Unit	Formal	Minimally retouched	Expedient	Minimally retouched/ expedient	Totals
41BL155, North Terrace	14	1	18	1	34
41BL181	1	–	7	–	8
41BL667	2	–	1	–	3
41BL827	–	–	2	–	2
41CV722, Analysis Unit 1	–	–	1	–	1
41CV944, Shelter A	1	–	–	–	1
41CV944, Shelter B	–	–	1	–	1
41CV1473	5	2	7	–	14
41CV1482, Analysis Unit 2	–	–	1	–	1
41CV1549, Analysis Unit 1	1	–	–	–	1
41CV1549, Analysis Unit 2	2	1	3	–	6
Totals	26	4	41	1	72

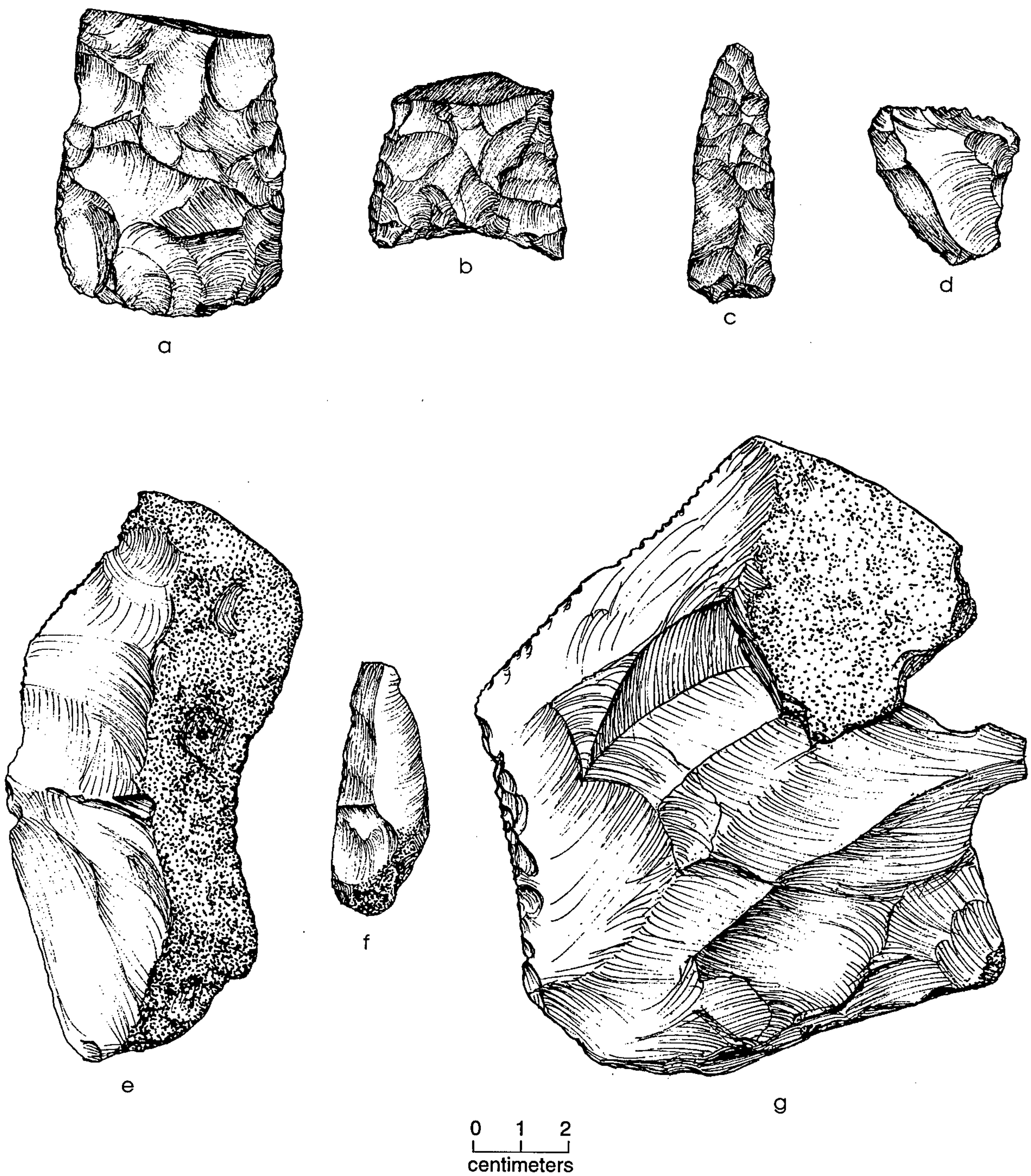

Figure 72. Knives. (*a*) Formal knife (41BL667); (*b–c*) formal knives (41BL155); (*d*) minimally retouched knife (41CV1473); (*e*) expedient knife (41CV1482); (*f*) expedient knife (41CV1473); (*g*) knife with minimally retouched and expedient working edges (41BL155).

(mean = 9.0 ± 6.7 mm, n = 4).

The 41 expedient knives represent flakes and blades that were used in cutting tasks without prior or subsequent retouching of the cutting edges (Figure 72*e, f*). The range of flake/ blade shapes is the same as that noted among the minimally retouched specimens. Twenty (48.8 percent) of the expedient knives represent

tertiary flake/blade blanks, while 16 (39.0 percent) others are secondary, partially corticate, specimens. Five (12.2 percent) fragmentary specimens are decorticate (i.e., tertiary) blanks, although it cannot be assumed that they did not retain cortex in their complete state. Twenty-seven (65.9 percent) are complete knives, 8 (19.5 percent) are proximal fragments, 4 (9.8 percent) are distal fragments, and 1 (2.4 percent) each is a medial and indeterminate edge fragment. Break cause could not be identified with certainty on any of the expedient knife fragments. The expedient knives range in maximum length from 23 to 112 mm (mean = 40.0 ± 17.2 mm, n = 27). Their maximum widths range from 11 to 97 mm (mean = 34.3 ± 19.3 mm, n = 33), and they range in maximum thickness from 2 to 30 mm (mean = 7.9 ± 5.6 mm, n = 41).

The single knife with one minimally retouched and one expedient cutting edge is a secondary macroflake blank (Figure 72*g*). Its right longitudinal edge is divided into two segments by a sharp angle about midway along its length. The portion of the edge closest to the striking platform is bifacially flaked, while the segment nearest the distal end retains only use-derived flake scarring. Maximum flake measurements are 121 mm in length, 122 mm in width, and 20 mm in thickness.

Given the similarities in morphology between the minimally retouched and expedient knives, it is likely that, rather than being a specific morphological type, minimally retouched knives represent a point along the use-life trajectory of knives. That is, minimally retouched knives represent expedient specimens that were utilized and resharpened once their working edges dulled. This interpretation is supported by the single specimen with both minimally retouched and expedient cutting edges. In contrast to these knives, the formal specimens probably represent distinct manufacture sequences in that a fully bifacially flaked artifact was produced before the specimen was judged functional. It is likely that minimally retouched knives did not progress to formal bifacial knives with increased resharpening since these flakes and blades would have been too small to serve as blanks for bifacial knives.

Scrapers

A total of 176 scrapers have been identified in the artifact samples. All are made of fine-grained chert. Type 8 (FHY, n = 46, 26.1 percent), Type 6 (HLT, n = 45, 25.6 percent), and Type 34 (indeterminate light brown, n = 22, 12.5 percent) occur in the highest frequencies. Type 35 (indeterminate dark brown, n = 15, 8.5 percent), Type 9 (HLTB, n = 13, 7.4 percent), and Type 10 (HLB, n = 10, 5.7 percent) occur in moderate frequencies. Other cherts represented are as follows: Type 31 (indeterminate mottled, n = 5, 2.8 percent); Type 2 (CW, n = 4, 2.3 percent); Types 15 (GBG), 17 (OCB), 29 (indeterminate white), 32 (indeterminate light gray), 33 (indeterminate dark gray), and 38 (red), represented by two (1.1 percent) specimens each; and Types 11 (ERF), 13 (ER-flecked), 18 (CTT), and 30 (indeterminate yellow), represented by one (0.6 percent) specimen each. The breakdown by working edge location is shown in Table 32. Side scrapers dominate the collection, constituting 52.8 percent (n = 93). End scrapers (n = 49, 27.8 percent) are the second most common category, while end/side scrapers represent only 16.5 percent (n = 29) of the combined samples. The remaining scrapers consist of 3 spokeshaves (1.7 percent) and 2 specimens (1.1 percent) with one edge employed as an end scraper and a second edge modified into a spokeshave. Each of the functional subcategories is further divided into at least three morphological groups (e.g., formal, minimally retouched, and expedient) based on degree of retouch.

End Scrapers

No formal end scrapers are present. Most (n = 32, 65.3 percent) of the 49 end scrapers are expedient specimens (Table 33) characterized by no retouch of the working edge prior or subsequent to tool use (Figure 73*a*). Most (n = 23, 71.9 percent) of the expedient specimens represent flake blanks used in the performance of light-duty scraping tasks. The remaining 9 (28.1 percent) are so fragmentary that it cannot be established whether they represent flakes or blades. More than half (n = 21, 65.6 percent) of the flakes are tertiary, while the remainder (n = 11, 34.4 percent) retain some cortex (i.e., are secondary). Twenty-two (68.8 percent) of the expedient end scrapers are complete; the other 10 (31.3 percent) are distal fragments. The cause of break could not be identified on the 10 fragments. The expedient end scrapers range in maximum length

Table 32. Breakdown of scrapers by location of working edge

Site, Analysis Unit	End scrapers	Side scrapers	End/side scrapers	Spoke-shaves	Spokeshaves/ end scrapers	Totals
41BL69, Shelter A	1	1	1	1	–	4
41BL155, North Terrace	34	36	17	1	1	89
41BL155, South Terrace	–	–	1	–	–	1
41BL181	–	13	3	–	–	16
41BL581	–	1	–	–	–	1
41BL582, Shelter A	–	–	1	–	–	1
41BL667	–	–	2	–	–	2
41BL827	2	8	1	–	–	11
41CV722, Analysis Unit 1	2	2	–	–	–	4
41CV722, Analysis Unit 2	–	4	–	–	–	4
41CV722, Analysis Unit 3	–	5	–	–	–	5
41CV944, Shelter A	1	3	1	–	1	6
41CV1473	6	10	1	1	–	18
41CV1478, Analysis Unit 2	1	4	1	–	–	6
41CV1479, Analysis Unit 2	1	–	–	–	–	1
41CV1482, Analysis Unit 2	1	4	–	–	–	5
41CV1549, Analysis Unit 1	–	2	–	–	–	2
Totals	49	93	29	3	2	176

Table 33. Morphological subgroupings for end scrapers

Site, Analysis Unit	Minimally retouched	Expedient	Totals
41BL69, Shelter A	–	1	1
41BL155, North Terrace	15	19	34
41BL827	1	1	2
41CV722, Analysis Unit 1	–	2	2
41CV944, Shelter A	1	–	1
41CV1473	–	6	6
41CV1478, Analysis Unit 2	–	1	1
41CV1479, Analysis Unit 2	–	1	1
41CV1482, Analysis Unit 2	–	1	1
Totals	17	32	49

from 9 to 47 mm, (mean = 29.2 ± 9.3 mm, n = 22), in maximum width from 11 to 49 mm, (mean = 26.9 ± 8.9 mm, n = 27), and in maximum thickness from 2 to 11 mm (mean = 6.1 ± 2.4 mm, n = 32).

Seventeen (34.7 percent) of the end scrapers are minimally retouched (Figure 73*b*). These specimens are made on small to medium-sized primary (n = 2, 11.8 percent), secondary (n = 5, 29.4 percent), and tertiary (n = 10, 58.8 percent) blanks. Thirteen (76.5 percent) of the blanks represent flakes, and only two (11.8 percent) have been identified as blade blanks. The remaining two pieces are too small to identify the blank type. The large majority (n = 15, 88.2 percent) of these minimally retouched end scrapers are complete; the remaining two (11.8 percent) are distal fragments. The minimally retouched end scrapers range in maximum length from 24 to 72 mm (mean = 44.7 ± 15.5 mm, n = 15), in maximum width from 19 to 78 mm (mean = 38.8 ± 15.3 mm, n = 16), and in maximum thickness from 6 to 27 mm (mean = 13.4 ± 6.5 mm, n = 17).

Side Scrapers

As with the end scrapers, the majority (n= 71, 76.3 percent) of the 93 side scrapers are expedient specimens (Table 34). Minimally retouched side scrapers are the second most numerous category (n = 17, 18.3 percent), followed by formal (n = 4, 4.3 percent) specimens. A single (1.1 percent) side scraper has one minimally retouched and one expedient working edge.

The side scrapers are small to medium-sized tertiary (n = 53, 57.0 percent) and secondary (n = 33, 35.5 percent) flakes and blades (Figure 73*c*). Seven (7.5 percent) fragmentary specimens are entirely decorticate, although it

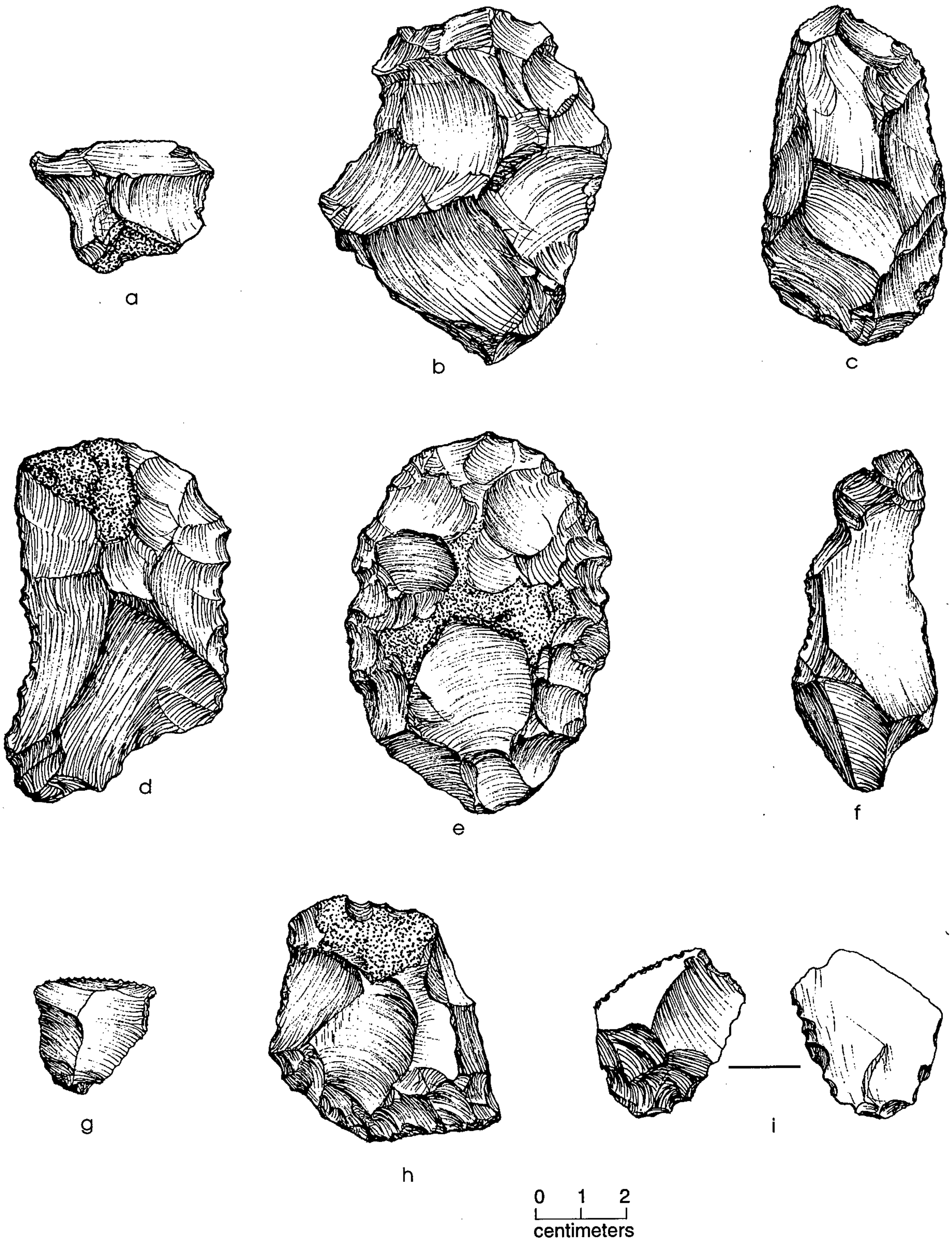

Figure 73. Scrapers. (*a*) Expedient end scraper (41CV1473); (*b*) minimally retouched end scraper (41BL155); (*c*) expedient side scraper (41BL155); (*d*) minimally retouched side scraper (41BL581); (*e*) formal side scraper (41BL181); (*f*) side scraper with minimally retouched and expedient working edges (41BL155); (*g*) expedient end/side scraper (41BL155); (*h*) minimally retouched end/side scraper (41BL181); (*i*) minimally retouched side/expedient end scraper, both faces (41BL155).

Table 34. Morphological subgroupings for side scrapers

Site, Analysis Unit	Formal	Minimally Retouched	Expedient	Minimally Retouched/ Expedient	Totals
41BL69, Shelter A	–	–	1	–	1
41BL155, North Terrace	–	3	32	1	36
41BL181	2	5	6	–	13
41BL581, Shelter B	–	1	–	–	1
41BL827	–	2	6	–	8
41CV722, Analysis Unit 1	–	1	1	–	2
41CV722, Analysis Unit 2	1	1	2	–	4
41CV722, Analysis Unit 3	1	1	3	–	5
41CV944, Shelter A	–	–	3	–	3
41CV1473	–	2	8	–	10
41CV1478, Analysis Unit 2	–	–	4	–	4
41CV1482, Analysis Unit 2	–	–	4	–	4
41CV1549, Analysis Unit 2	–	1	1	–	2
Totals	4	17	71	1	93

cannot be assumed that they were so in their complete state. The majority (n = 66, 71.0 percent) of the side scrapers represent flake blanks. A few (n = 17, 18.3 percent) also reflect the use of blades as tool blanks. The nature of the blanks employed could not be determined on 10 (10.8 percent) fragments. Sixty-eight (73.1 percent) are complete, nearly a fourth (n = 23, 24.7 percent) are distal fragments, and one (1.1 percent) each is a nearly complete proximal fragment and a longitudinal fragment. Of the 25 incomplete specimens, only 5 (20.0 percent) could be identified as use broken, while the cause of break could not be determined on 20 (80.0 percent) fragments. The side scrapers range in maximum length from 12 to 85 mm (mean = 40.7 ± 16.2 mm, n = 70), in maximum width from 9 to 75 mm (mean = 31.2 ± 14.1 mm, n = 84), and in maximum thickness from 2 to 31 mm (mean = 8.8 ± 5.6 mm, n = 93).

The 17 minimally retouched side scrapers are made on secondary (n = 11, 64.7 percent) and tertiary (n = 4, 23.5 percent) flakes and blades (Figure 73*d*). As in the case of all scrapers, flake blanks (n = 11, 64.7 percent) are more common than blade blanks (n = 3, 17.6 percent). Two (11.8 percent) are so fragmentary that the nature of the blank could not be determined. Twelve (70.6 percent) of the minimally retouched side scrapers are complete. The remaining specimens (n = 5, 29.4 percent) are distal fragments. The minimally retouched side scrapers range in maximum length from 26 to 85 mm (mean = 51.6 ± 18.2 mm, n = 12), in maximum width from 14 to 75 mm (mean = 42.4 ± 17.4 mm, n = 14), and in maximum thickness from 6 to 24 mm (mean = 12.8 ± 5.5, n = 17).

The few formal side scrapers (n = 4) are made on secondary flakes (n = 2) and blades (n = 1) (Figure 73*e*). The nature of the core could not be determined on a single fragmentary specimen. Only one of the formal side scrapers is complete; the three others are distal tool fragments. One of the three fragmentary scrapers has been broken in use, and the cause of break could not be identified on the remaining two. The single complete formal side scraper measures 81 m in maximum length; the scrapers range in maximum width from 38 to 57 mm (mean = 46.7 ± 9.6 mm, n = 3) and in maximum thickness from 8 to 21 mm (mean = 14.2 ± 5.4 mm, n = 4).

The single side scraper with both minimally retouched and expedient working edges is a complete tertiary blade (Figure 73*f*). The blade is 74 mm long, 32 mm wide, and 10 mm thick.

End/Side Scrapers

As in the case of the other scrapers, the majority (n = 15, 51.7 percent) of the 29 end/side scrapers are expedient specimens (Table 35). Minimally retouched end/side scrapers are the second most numerous category (n = 10, 34.5 percent), followed by formal (n = 2, 6.9 percent) specimens. A single (3.4 percent) end/side

Table 35. Morphological subgroupings for end/side scrapers

Site, Analysis Unit	Formal	Minimally Retouched	Expedient	Minimally Retouched/ Expedient	Formal/ Expedient	Totals
41BL69, Shelter A	1	–	–	–	–	1
41BL155, North Terrace	–	6	10	1	–	17
41BL155, South Terrace	–	1	–	–	–	1
41BL181	–	1	2	–	–	3
41BL582, Shelter A	–	–	1	–	–	1
41BL667	–	–	2	–	–	2
41BL827	–	–	–	–	1	1
41CV944, Shelter A	–	1	–	–	–	1
41CV1473	1	–	–	–	–	1
41CV1478, Analysis Unit 2	–	1	–	–	–	1
Totals	2	10	15	1	1	29

scraper has one formal and one expedient working edge, and another specimen has a minimally retouched edge and an expedient working edge.

The 15 expedient end/side scrapers are small to medium-sized tertiary (n = 12, 80.0 percent) and secondary (n = 3, 20.0 percent) blanks (Figure 73*g*). Nearly all (n = 14, 93.3 percent) of these blanks represent flakes. The nature of the blank could not be determined on the only remaining (6.7 percent) fragment. Twelve (80.0 percent) are complete, two (13.3 percent) are distal fragments, and one (6.7 percent) is a longitudinal specimen. These expedient end/side scrapers range in maximum length from 14 to 53 mm (mean = 32.3 ± 11.7 mm, n = 14), in maximum width from 18 to 52 mm (mean = 30.5 ± 10.0 mm, n = 14), and in maximum thickness from 4 to 16 mm (mean = 8.0 ± 3.8 mm, n = 15).

The 10 minimally retouched end/side scrapers are made on secondary (n = 8) and tertiary (n = 2) flakes and blades (Figure 73*h*). Flake cores are more common (n = 7) than blade cores (n = 2). The nature of one blank could not be determined. Eight are complete, and the two others are distal fragments. These minimally retouched scrapers range in maximum length from 24 to 118 mm (mean = 55.0 ± 28.8 mm, n = 8), in maximum width from 27 to 70 mm (mean = 48.9 ± 14.7 mm, n = 8), and in maximum thickness from 6 to 24 mm (mean = 14.4 ± 5.5 mm, n = 10).

Both of the formal end/side scrapers are fragmentary specimens (not illustrated). One was made on a flake blank; the nature of the blank could not be identified on the second fragment. Both are entirely decorticate; however, whether they were tertiary specimens in their complete state cannot be determined. One is use broken; the cause of the break could not be identified on the other specimen. Maximum thickness is the only measurement that could be obtained from the two tool fragments. The two specimens are 11 and 15 mm thick.

A single end/side scraper with a formal edge and an expedient working edge is present (not illustrated). It is a distal tool fragment made on a secondary flake. It has a formally retouched side and a distal end exhibiting only use modification. The flake measures 6 mm in maximum thickness. Other complete measurements cannot be obtained.

The only end/side scraper with a minimally retouched side scraper edge and an expediently used distal working edge is a secondary flake. It has three distinct working edges. The expedient end scraper edge and a small concave, spokeshavelike working edge along the margin are on one face. A more heavily retouched side scraper working edge is on the opposite face (Figure 73*i*). Maximum tool measurements are 34 mm in length, 33 mm in width, and 8 mm in thickness.

Spokeshaves

Three specialized spokeshaves were identified (Table 36); two are minimally retouched and the third is an expedient specimen. One of the two minimally retouched specimens is made on a complete tertiary flake blank (Figure 74*a*). The other represents a decorticate blank fragment

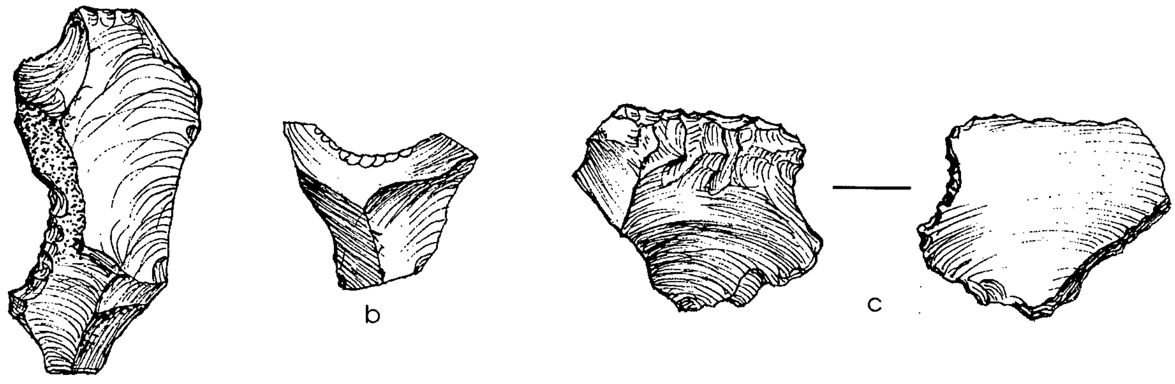

Figure 74. Spokeshave scrapers. (*a*) Minimally retouched (41CV1473); (*b*) expedient (41BL69); (*c*) combination minimally retouched spokeshave/expedient end scraper (41BL155).

Table 36. Morphological subgroupings for spokeshaves

Site, Analysis Unit	Minimally Retouched	Expedient	Totals
41BL69, Shelter A	–	1	1
41BL155, North Terrace	1	–	1
41CV1473	1	–	1
Totals	2	1	3

that might have been either a flake or blade in its complete state. It is not possible to determine whether this spokeshave represents a complete tool or only a distal fragment. In the case of the first specimen, the concave working edge is on the lateral edge. For the second specimen, it is on the distal edge. The complete spokeshave has a maximum length of 48 mm, a maximum width of 25 mm, and a maximum thickness of 5 mm. The incomplete minimally retouched specimen has a maximum width of 27 mm and is 7 mm thick at its maximum.

The single expedient spokeshave represents a decorticate blank fragment that might have been a blade in its complete state (Figure 74*b*). The expedient working edge is located on the distal edge of the specimen. It has a maximum width of 25 mm and a maximum thickness of 5 mm.

Combination Spokeshave/ End Scrapers

Two combination spokeshave/end scrapers are present. In each case, the spokeshave portion of the tool has been minimally retouched while the end scraper segment represents an expediently utilized unretouched working edge. Both tools are complete. One is made on a complete tertiary flake blank (Figure 74*c*), while the other represents a secondary distal flake fragment. In both cases, the two working edges are on alternate faces of the tools. The concave spokeshave working edges are on the lateral edges. In the case of the tertiary flake blank, the expedient working edge is on the distal end. The expedient scraper edge is on the break face of the secondary flake blank. The tertiary specimen measures 27 mm in maximum length, 33 mm in maximum width, and 7 mm in maximum thickness. The secondary flake measures 21 mm in maximum length, 22 mm in maximum width, and 7 mm in maximum thickness.

Choppers

Fourteen choppers are present (Table 37). They are characterized by subtriangular to ovate shapes and unifacially and/or bifacially flaked working edges commonly backed by corticate surfaces. The working edges exhibit substantial step fracturing and crushing that developed into smooth rounding in more heavily used portions of the edge.

Five (35.7 percent) have working edges that

Table 37. Distribution of choppers by site and analysis unit

Site	Number of specimens
41BL155, North Terrace	6
41BL181	3
41BL582, Shelter A	1
41CV722, Analysis Unit 1	1
41CV722, Analysis Unit 2	1
41CV722, Analysis Unit 3	1
41CV1482, Analysis Unit 2	1
Totals	14

were at least partially or fully unifacially flaked (Figure 75*a*). These specimens might have been employed as unidirectional cores then recycled into choppers. The other specimens are angular and/or roughly subtriangular nodules that have flake removals on two or more faces (Figure 75*b*).

All are made on fine-grained chert nodules. Ten (71.4 percent) are complete tools, and 4 (28.6 percent) are distal fragments. One of the incomplete specimens was broken in use; the cause of break could not be identified on the other fragments. The specimens range in maximum length from 56 to 125 mm (mean = 84.9 ± 223.2 mm, n = 10), in maximum width from 52 to 89 mm (mean = 65.4 ± 12.7 mm, n = 11), and in maximum thickness from 26 to 76 mm (mean = 43.6 ± 16.7 mm, n = 14).

The lightest complete chopper weighs 90.7 g, while the second lightest weighs 112 g. The eight other complete specimens weigh between 186 and 833 g, with four of these weighing more than 400 g. The range of weights suggests that a broad range of materials was processed with these tools.

Previous analyses of Fort Hood materials may have categorized some of these tools as hammerstones rather than choppers. Chert hammerstones are known from other archeological collections (Mallouf 1989:Figure 10b) and might be expected in settings where quartzite is lacking and/or is found only in small pebbles. Furthermore, the use of a wedge-shaped bifacially flaked edge as a hammerstone can result in similar

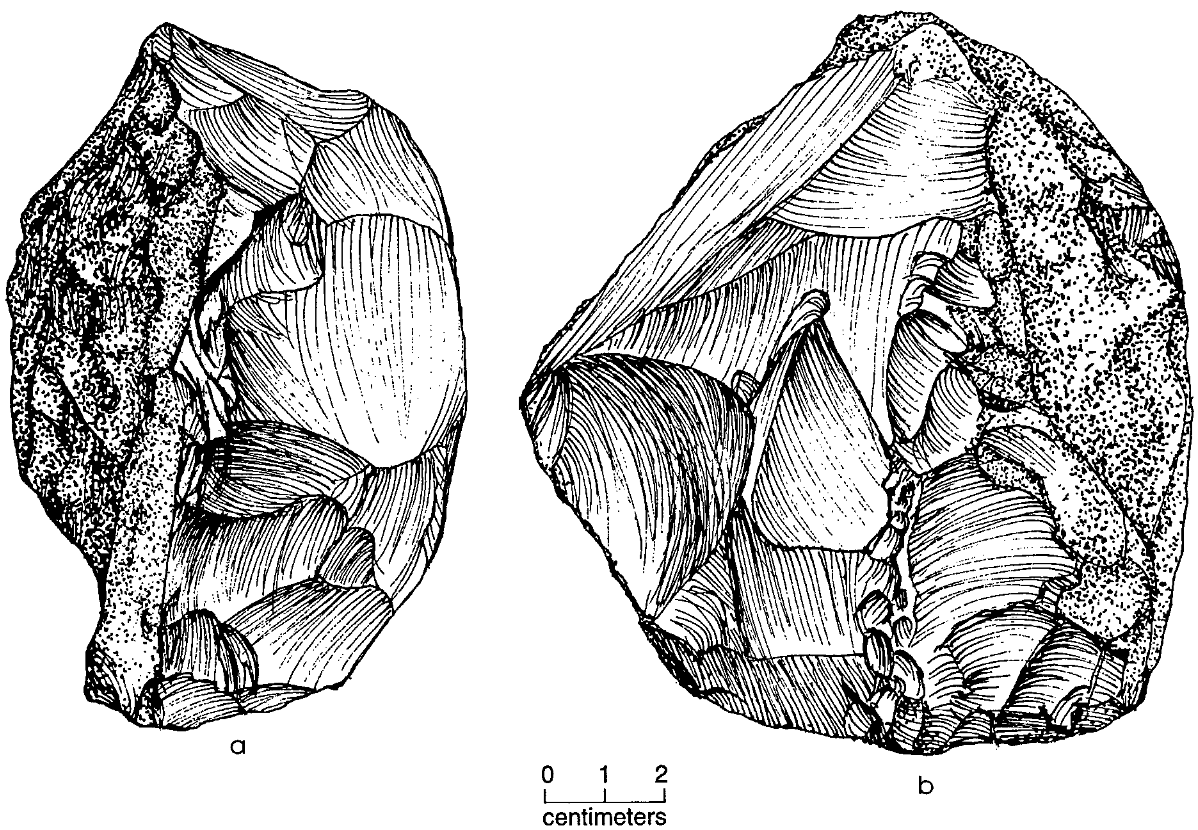

Figure 75. Choppers. (*a*) Unifacially flaked working edge (41BL155); (*b*) bifacially flaked working edge (41BL155).

macroscopic use wear as the use of that same edge as a chopper. Since none of these specimens has been used sufficiently to develop use polish, the possibility exists that some of them might have been used as hammerstones rather than choppers.

Gravers

Of 13 gravers, 7 (53.8 percent) are classified as minimally retouched and 3 (23.1 percent) each are expedient and formal (Table 38). All are made of fine-grained chert. The most common chert is Type 8 (FHY, n = 4, 30.8 percent), followed by Type 6 (HLT, n = 3, 23.1 percent), and Type 15 (GBG, n = 2, 15.4 percent). Types 9, 10, 13, and 32 are each represented by a single specimen (7.7 percent).

The working tips on the minimally retouched gravers are located on the distal ends of the flake blanks and were made by the removal of only two to three flakes on either side of the tip (Figure 76*a*, *b*). Six (85.7 percent) of the seven minimally retouched gravers are made on secondary (n = 2) and tertiary (n = 4) complete and fragmentary flake blanks. It is likely, however, that even the gravers made on fragmentary flake blanks represent complete tools. The seventh specimen is a minimally retouched uniface recycled into a graver (Figure 76*b*). It cannot be established whether the uniface was broken or complete when it was reworked into the new tool type. The seven minimally retouched specimens range in maximum length from 14 to 72 mm (mean = 37.4 ± 21.8 mm), in maximum width from 11 to 49 mm (mean = 29.1 ± 13.1 mm), and in maximum thickness from 3 to 21 mm (mean = 11.3 ± 7.1 mm).

Two of the three formal gravers are secondary flake blanks (Figure 76*c*). The third specimen is made on a blank that might be a blade fragment judging from the strong medial ridge on its dorsal surface; it also is partially corticate. It cannot be determined whether this is a complete tool made on a blank fragment or a tool fragment. The formal gravers range in maximum length from 44 to 55 mm (mean = 49.5 ± 7.8 mm, n = 2), in maximum width from 27 to 43 mm (mean = 33.7 ± 8.3 mm, n = 3), and in maximum thickness from 8 to 18 mm (mean = 11.7 ± 5.5 mm, n = 3).

One of the three expedient gravers is a secondary blank fragment that is too small to determine whether it is a flake or blade. It has two graver edges that have been resharpened by burin removals (Figure 76*d*). Another of the expedient gravers is a dart point medial fragment with two graver edges, both exhibiting multiple burin scars (Figure 76*e*). The final specimen is also a recycled dart point fragment. It is an expanding stemmed proximal fragment (Figure 76*f*) with a graver edge located on the distal end of the blade. It exhibits multiple burin resharpening scars removed from both edges of the blade. All of the expedient gravers are complete tools. They range in maximum length from 33 to 35 mm (mean = 34.0 ± 1.4 mm), in maximum width from 16 to 25 mm (mean = 20.5 ± 6.4 mm), and in maximum thickness from 6 to 13 mm (mean = 8.7 ± 3.8 mm).

Multifunctional Tools

Five multifunctional tools have been identified. They are divided into three multifunctional combinations consisting of knives/side scrapers (n = 2), gravers/side scrapers (n = 2), and a single spokeshave/graver. Specimens within these groups were further subdivided into morpho-logical subcategories consisting of tools with all expedient working edges, all minimally retouched, and all formal edges, as well as one tool with an expedient edge and a minimally retouched working

Table 38. Morphological subgroupings for gravers

Site, Analysis Unit	Formal	Minimally retouched	Expedient	Totals
41BL155, North Terrace	–	4	1	5
41BL181	1	1	1	3
41BL667	1	–	–	1
41CV722, Analysis Unit 1	–	–	1	1
41CV944, Shelter A	–	1	–	1
41CV1473	1	1	–	2
Totals	3	7	3	13

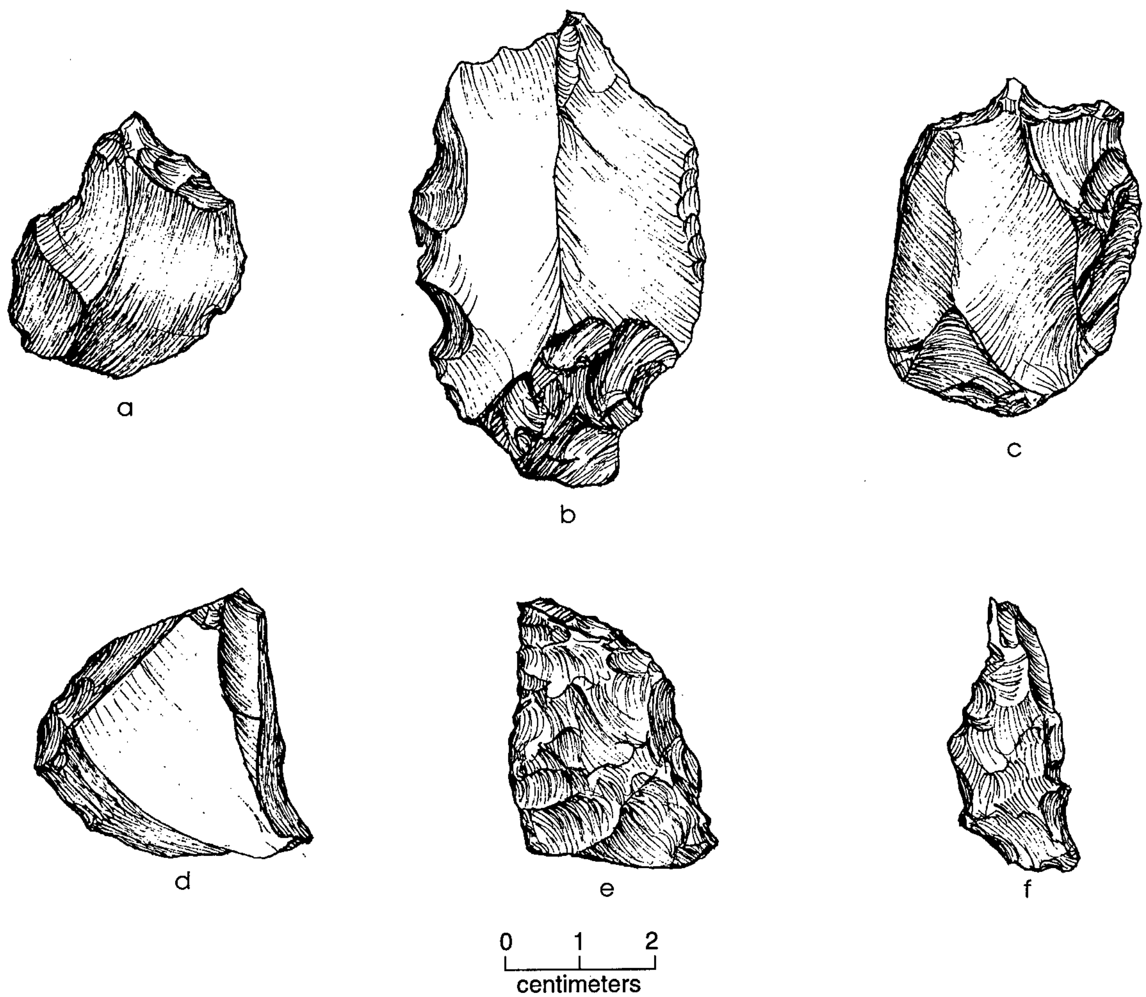

Figure 76. Gravers. (*a*) Minimally retouched graver (41BL155); (*b*) minimally retouched graver (41CV1473); (*c*) formal graver (41CV1473); (*d*) expedient graver on a flake (41CV722); (*e*) expedient graver on a dart point medial fragment (41BL181); (*f*) expedient graver on an expanding stemmed dart point (41BL155).

edge. All of the specimens are of fine-grained chert, consisting of two Type 6 (HLT), two Type 32 (indeterminate light gray), and one Type 34 (indeterminate light brown). Table 39, shows the breakdown of these tools by morphological subcategory within the functional subgroups.

The two multifunctional tools identified as knives/side scrapers have expedient working edges (Figure 77*a*). One is a complete secondary blade most likely removed by a billet. It has a single lateral working edge used for both cutting and scraping tasks. The second specimen is a secondary hard hammerstone flake. It has two working edges, each used in different tasks. The two flakes have a mean length of 57.5 mm (min. = 57, max. = 58), a mean width of 41 mm (min. = 29, max. = 53), and a mean thickness of 12.5 (min. = 9, max. = 16).

Both working edges on one of the two multifunctional gravers/side scrapers are formally retouched (Figure 77*b*). This tool is made on a complete tertiary hard hammerstone flake. Both lateral edges have been retouched into scrapers, while the distal edge and one intersecting lateral edge have been retouched to form a graver tip. The specimen measures 55 mm in length, 46 mm in maximum width, and 17 mm in maximum thickness. The second multifunctional graver/side scraper has a minimally retouched graver tip and an expedient side scraper working edge (Figure 77*c*). The graver is on the distal edge of the flake blank. It is made on a small

Table 39. Morphological subgroupings for multifunctional tools

Artifacts	41BL155, North Terrace	41BL181	41CV1473	Totals
Formal scraper/formal side scraper	–	1	–	1
Minimally retouched graver/expedient side scraper	1	–	–	1
Expedient knives/expedient side scrapers	1	–	1	2
Minimally retouched graver/spokeshave	1	–	–	1
Totals	3	1	1	5

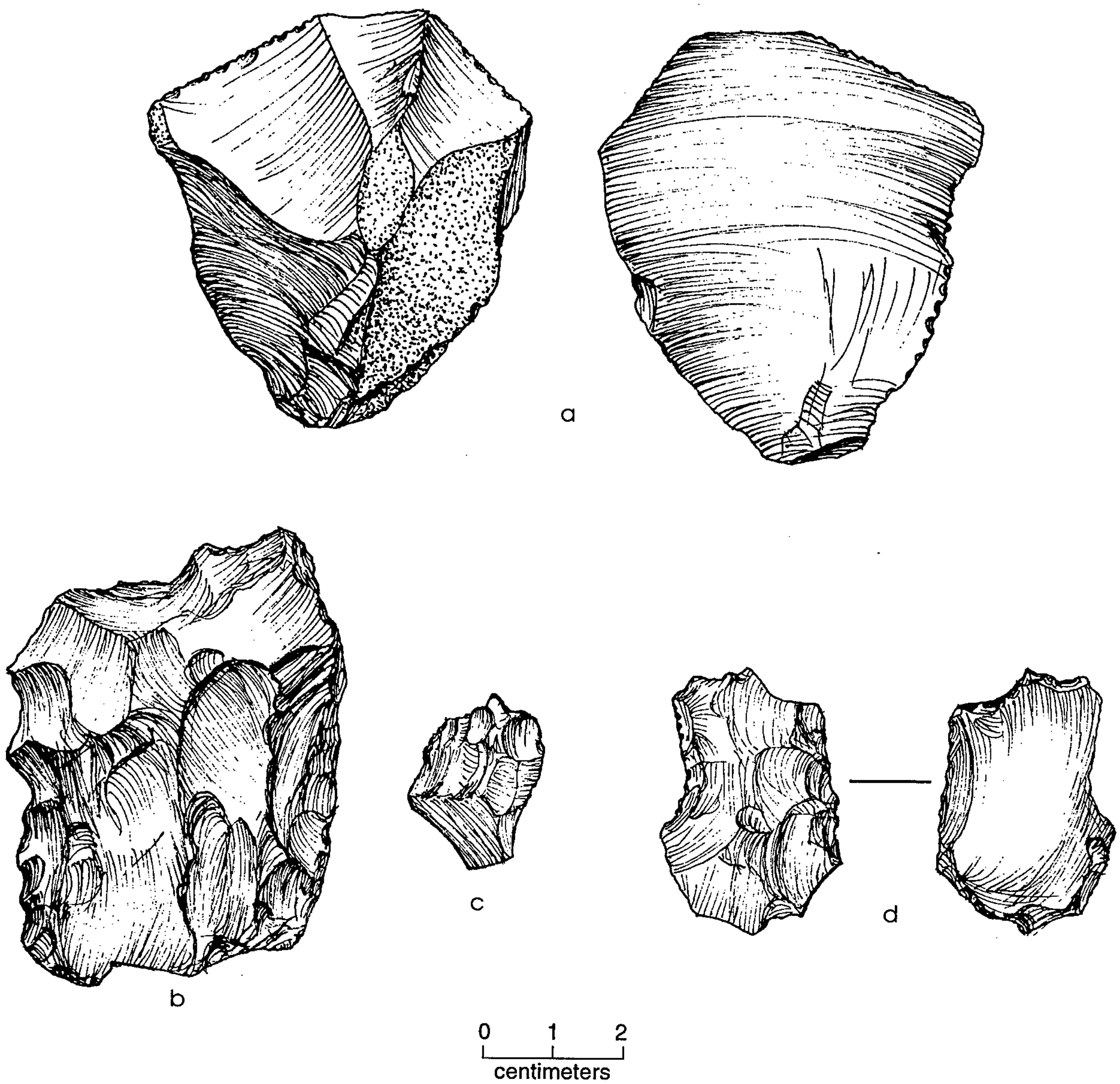

Figure 77. Multifunctional tools. (*a*) Expedient knife/expedient side scraper (41CV1473); (*b*) formal graver/side scraper (41BL181); (*c*) minimally retouched graver/expedient side scraper (41BL155); (*d*) minimally retouched graver/spokeshave (41BL155).

complete tertiary biface thinning flake. The specimen is 23 mm long, 21 mm wide, and 3 mm thick.

The single minimally retouched graver/spokeshave scraper is made on a small tertiary flake (Figure 77*d*). One of its lateral margins has been retouched into a graver tip from the dorsal surface. The concave spokeshave working edge is on the distal end and is flaked from the ventral surface of the flake. The flake is 25 mm long, 36 mm wide, and 8 mm thick.

Miscellaneous Bifaces

A total of 80 bifacially flaked artifacts could not be assigned to any of the previously discussed artifact categories (Table 40). All are of fine-grained chert. The most common chert is Type 8 (FHY, n = 18, 22.5 percent), followed by Types 6 (HLT) and 34 (indeterminate light brown) with 13 (16.3 percent) specimens each. Other chert types include the following: Type 29 (indeterminate white, n = 6, 7.5 percent); Type 9 (HLTB, n = 5, 6.3 percent); Type 10 (HLB, n = 5, 6.3 percent); Type 33 (indeterminate dark gray, n = 4, 5.0 percent); Type 17 (OCB, n = 3, 3.8 percent); Types 11 (ERF), 13 (ER-flecked), and 32 (indeterminate light gray), each represented by 2 (2.5 percent) specimens; and Types 14 (FHG), 15 (GBG), 18 (CTT), 19 (CDG), 31 (indeterminate mottled), 35 (indeterminate dark brown), and 38 (indeterminate red), each represented by a single (1.3 percent) specimen. Proximal specimens constitute the most common fragments (n = 27, 33.8 percent), followed by indeterminate bifacial edges (n = 20, 25.0 percent), distal fragments (n = 18, 22.5 percent), medial fragments (n = 5, 6.3 percent), wedge fragments (n = 5, 6.3 percent), and a single (1.3 percent) longitudinally broken specimen. The remaining 4 specimens (5 percent) are complete. The largest number (n = 37, 48.7 percent) of fragmentary specimens are manufacture broken, although nearly an equal number (n = 34, 44.7 percent) have indeterminate break morphologies. Of 5 (6.6 percent) fragments broken in use, 1 might be a wedge fragment and the other 4 may be adze fragments. The probable wedge is a distal fragment, while the probable adzes are proximal fragments. Of the 34 specimens for which no cause of break could be determined, 1 may be a possible arrow point fragment (distal), 2 may be proximal adze fragments, and 1 is a possible distal wedge fragment. These fragments all represent early (n = 2) and middle (n = 2) reduction stage specimens. They were not classified into these functional categories because significant portions of the tools are missing, not allowing the identification of crucial use-wear diagnostics.

Table 40. Distribution of miscellaneous bifaces by site and analysis unit

Site	Totals
41BL69, Shelter A	6
41BL155, North Terrace	38
41BL181, Analysis Unit 1	6
41BL667, Analysis Unit 1	3
41BL827, Analysis Unit 1	5
41CV722, Analysis Unit 1	4
41CV722, Analysis Unit 2	1
41CV722, Analysis Unit 3	1
41CV944, Shelter A	2
41CV944, Shelter B	1
41CV1473, Analysis Unit 1	7
41CV1479, Analysis Unit 1	1
41CV1482, Analysis Unit 2	4
41CV1549, Analysis Unit 2	1
Totals	80

The four complete miscellaneous bifaces consist of three small tertiary flake blanks with minimal marginal retouch and an early reduction stage corticate flake blank (see Figure 77*a*). The tertiary flake blanks are each classified as early reduction stage specimens. They range in maximum length from 33 to 36 mm (mean = 35.0 ± 1.7 mm), in maximum width from 23 to 27 mm (mean = 25.7 ± 2.3 mm), and in maximum thickness from 6 to 8 mm (mean = 6.7 ± 1.5 mm). The corticate flake blank measures 78 mm in length, 56 mm in maximum width, and 22 mm in maximum thickness.

The 4 (5.0 percent) complete specimens are entirely decorticate, 10 (12.5 percent) fragments retain some cortex, and the remaining 66 (82.5 percent) fragments are decorticate but might not have been so in their complete state. The largest number (n = 29, 36.3 percent) are early reduction bifaces (Figure 78*a, b*), followed by small fragments for which stage of reduction could not be determined (n = 21, 26.3 percent). Middle (n = 16, 20.0 percent; Figure 78*c*) and late reduction (n = 14, 17.5 percent; Figure 78*d*) specimens occur in nearly equal numbers.

Miscellaneous Unifaces

A total of 132 unifacially flaked indeterminate

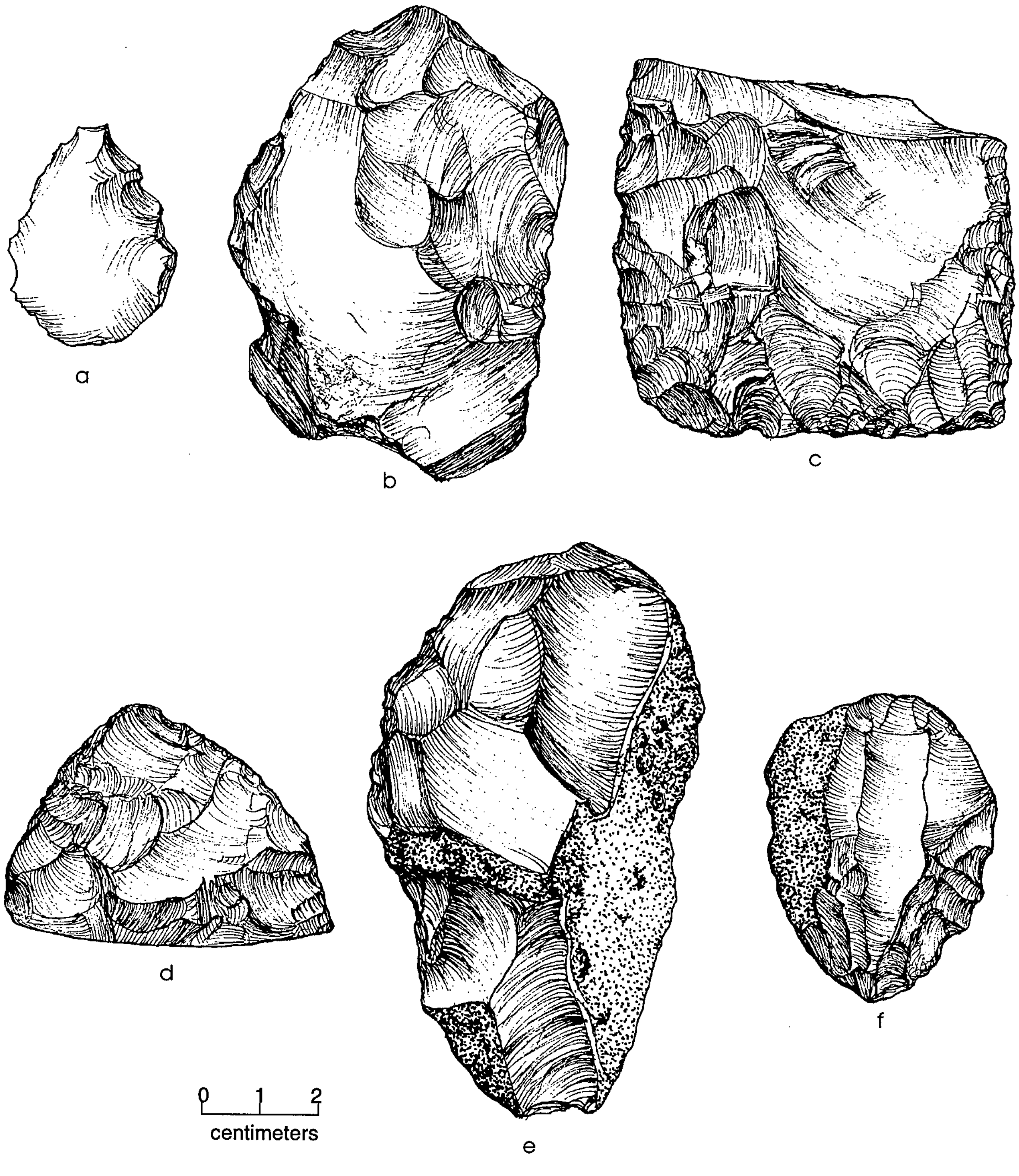

Figure 78. Miscellaneous bifaces and unifaces. (*a*) Early reduction biface on tertiary flake blank with minimal marginal retouch (41CV944); (*b*) early reduction biface (41BL69); (*c*) middle reduction biface (41BL155); (*d*) late reduction biface (41CV722); (*e*) uniface, possible manufacture discard (41BL582); (*f*) uniface, possibly reworked as an adze (41CV1482).

tool edges were identified (Table 41). Because of their fragmentary nature, they could not be classified into functional and morphological categories. All are fine-grained chert. The most common cherts are Type 6 (HLT, n = 27, 20.5 percent), Type 8 (FHY, n = 25, 18.9 percent), Type 34

Table 41. Distribution of miscellaneous unifaces by site and analysis unit

Site	Totals
41BL155, North Terrace	77
41BL181, Analysis Unit 1	12
41BL579, Shelter C	1
41BL582, Shelter A	1
41BL667, Analysis Unit 1	1
41BL827, Analysis Unit 1	13
41CV722, Analysis Unit 3	1
41CV944, Shelter A	6
41CV1473, Analysis Unit 1	14
41CV1478, Analysis Unit 2	1
41CV1482, Analysis Unit 2	5
Totals	132

(indeterminate light brown, n = 23, 17.4 percent), Type 10 (HLB, n = 13, 9.8 percent), and Type 9 (HLTB, n = 12, 9.1 percent). Infrequent types include the following: Type 35 (indeterminate dark brown, n = 8, 6.1 percent); Type 29 (indeterminate white, n = 7, 5.3 percent); Type 15 (GBG, n = 6, 4.5 percent); Type 32 (indeterminate light gray, n = 3, 2.3 percent); Types 31 (indeterminate mottled) and 2 (CW), with 2 (1.5 percent) each; and Types 11 (ERF), 17 (OCB), 30 (indeterminate yellow), and 33 (indeterminate dark gray), with 1 (0.8 percent) specimen each. Most (n = 49, 37.1 percent) are indeterminate edges, followed closely by proximal fragments (n = 47, 35.6 percent). Medial fragments (n = 18, 13.6 percent) are less common, while wedges (n = 5, 3.8 percent), distal fragments (n = 4, 3.0 percent), and longitudinal fragment (n = 1, 0.8 percent) are infrequent. Only 8 (6.1 percent) are complete. They consist of flake blanks that show minimal to moderate unifacial flaking and, in general, lack systematically flaked edges and traces of use wear. A single large secondary flake blank with a large knot and a series of hinge-fractured removal scars might be a manufacture discard (Figure 78*e*). An additional small tool fragment appears to have been reworked and possibly used as an adze (Figure 78*f*). However, microscopic use wear was not conclusive in establishing this later use, so the specimen was classified as a miscellaneous uniface.

Cores

Thirty-seven cores were recovered (Table 42). All are fine-grained chert. Chert Type 8 (FHY, n = 10, 27.0 percent) specimens are the most common, and Type 34 (indeterminate light brown, n = 6, 16.2 percent) and Type 6 (HLT, n = 5, 13.5 percent) occur in moderate quantities. Other chert types include the following: Types 9 (HLTB) and 32 (indeterminate light gray), each with 3 (8.1 percent) specimens; Types 10 (HLB) and 31 (indeterminate mottled), each with 2 (5.4 percent) specimens; and Types 11 (ERF), 15 (GBG), 19 (CDG), 29 (indeterminate white), 33 (indeterminate dark gray), and 38 (indeterminate red), each represented by a single specimen (2.7 percent). The cores range in maximum length from 22 to 117 mm (mean = 58.4 ± 22.2 mm), in maximum width from 17 to 98 mm (mean = 45.7 ± 20.2 mm), and in maximum thickness from 11 to 52 mm (mean = 26.2 ± 12.3 mm). They have a mean of 12.6 (σ = 5.7) flake scars per specimen (min. = 2, max. = 27).

Table 42. Distribution of cores by site and analysis unit

Site	Totals
41BL155, North Terrace	8
41BL155, South Terrace	2
41BL181, Analysis Unit 1	4
41BL667, Analysis Unit 1	6
41BL827, Analysis Unit 1	3
41CV722, Analysis Unit 2	2
41CV722, Analysis Unit 3	1
41CV944, Shelter A	2
41CV1473, Analysis Unit 1	7
41CV1478, Analysis Unit 2	1
41CV1482, Analysis Unit 2	1
Totals	37

Unmodified Debitage

A total of 17,712 unmodified debitage pieces were recovered (see Table 23). Thirty-three (0.2 percent) of these were found to contain incorrectable coding errors following data entry. To simplify the discussion, these 33 specimens were deleted from the database, and the subsequent discussion deals only with the remaining 17,679 specimens (Table 43). Because debitage from National Register–eligible sites (n = 9,937, 56.2 percent) was analyzed more intensively than specimens from ineligible sites (n = 7,742, 43.8 percent), this discussion is divided into two segments.

Table 43. Distribution of unmodified debitage by site and analysis unit

Site	Totals	Site	Totals
41BL69, Shelter A	679	41CV944, Shelter A	935
41BL155, North Terrace	6,337*	41CV944, Shelter B	78
41BL155, South Terrace	17*	41CV1348, Shelter 1	1
41BL181, Analysis Unit 1	3,081	41CV1473, Analysis Unit 1	2,149
41BL579, Shelter B	2	41CV1478, Analysis Unit 1	2*
41BL579, Shelter C	32	41CV1478, Analysis Unit 2	53*
41BL581, Shelter B	1*	41CV1478, Analysis Unit 3	24*
41BL582, Shelter A	171*	41CV1479, Analysis Unit 1	6*
41BL582, Shelter B	5	41CV1479, Analysis Unit 2	25*
41BL667, Analysis Unit 1	733	41CV1480, Analysis Unit 1	2*
41BL816, Analysis Unit 1	38	41CV1482, Analysis Unit 2	112*
41BL827, Analysis Unit 1	2,093*	41CV1482, Analysis Unit 3	166*
41CV722, Analysis Unit 1	317*	41CV1487, Analysis Unit 2	9
41CV722, Analysis Unit 2	187*	41CV1549, Analysis Unit 1	70*
41CV722, Analysis Unit 3	67*	41CV1549, Analysis Unit 2	287*
Totals			17,679

NOTE: Excludes 33 specimens deleted from database due to coding errors.
*Analysis units recommended as eligible for listing on the NRHP.

All of the debitage recovered from NRHP-eligible sites is fine-grained chert. Most (n = 7,015, 70.6 percent) of these are indeterminate chert types, and only 29.4 percent (n = 2,922) could be assigned to the 28 identified chert types (Table 44). Of the 28 chert types, the largest quantities are in Type 6 (HLT, n = 1,007, 10.1 percent), Type 9 (HLTB, n = 599, 6.0 percent), Type 8 (FHY, n = 508, 5.1 percent), and Type 10 (HLB, n = 494, 5.0 percent). Chips constitute the majority (n = 5,553, 55.9 percent) of the debitage, followed by complete flakes (n = 2,248, 22.6 percent) and proximal flake fragments (n = 2,012, 20.2 percent). Angular debris is scarce (n = 124, 1.2 percent). Specimens smaller than or equal to ½ inch constitute the bulk (n = 7,021, 70.7 percent) of the collection. Specimens measuring between ½ and 1 inch constitute nearly one quarter of the sample (n = 2,269, 22.8 percent). Debitage larger than 1 inch constitutes only 6.5 percent (n = 647). Most of the debitage (n = 8,652, 87.1 percent) is entirely decorticate (i.e., tertiary), while primary debitage makes up only 1.1 percent (n = 111). Specimens with less than 50 percent cortex are more common (n = 888, 8.9 percent) than those with 51–99 percent cortex (n = 286, 2.9 percent). Out of the 4,260 platform-bearing complete flakes and proximal flake fragments, single-faceted platforms are more common than any other category (n = 1,804, 42.3 percent), although platforms with three or more facets also constitute a relatively large percentage (n = 1,751, 41.1 percent). Corticate platforms (n = 234, 5.5 percent) and platforms with two facets (n = 471, 11.1 percent) are infrequent. Slightly more than half (n = 5,174, 52.1 percent) of the debitage has not been exposed to heat, while evidence of heat alteration was indeterminate on 959 (9.7 percent) specimens. Heated and heat-spalled specimens that were exposed to heat after discard together constitute nearly a quarter of the specimens (n = 2,167, 21.8 percent). Heat-treated and stage-heat-treated debitage combined make up about one-sixth of the sample (n = 1,637, 16.5 percent). Debitage specimens without patina constitute the bulk of the sample (n = 6,587, 66.3 percent), and items with patina on both faces are more common that those with patina on one face. The breakdown of debitage by flake type indicates that specimens associated with biface manufacture are the most common category (n = 4,488, 45.2 percent; biface thinning, resharpening, notching, and biface flakes combined). It is likely that debitage derived from bifacial reduction is even more common when one considers that most of the platform/core preparation debitage (n = 2,942, 29.6 percent) probably also represents biface manufacture. Debitage derived from uniface manufacture, resharpening, and rejuvenation

Table 44. Chert types represented in the unmodified debitage assemblages

Type number	Name	NRHP-eligible analysis units #	NRHP-eligible analysis units %	NRHP-ineligible analysis units #	NRHP-ineligible analysis units %	All Analysis Units #	All Analysis Units %
1	Heiner Lake Blue-Light	4	<0.1	0	0.0	4	0.0
2	Cowhouse White	33	0.3	61	0.8	94	0.5
3	Anderson Mountain Gray	1	<0.1	4	0.1	5	0.0
4	Seven Mile Mountain Novaculite	0	0.0	0	0.0	0	0.0
5	Texas Novaculite	1	<0.1	0	0.0	1	0.0
6	Heiner Lake Tan	1,007	10.1	79	1.0	1,086	6.1
7	Fossiliferous Pale Brown	10	0.1	0	0.0	10	0.1
8	Fort Hood Yellow	508	5.1	3,110	40.2	3,618	20.5
9	Heiner Lake Translucent Brown	599	6.0	23	0.3	622	3.5
10	Heiner Lake Blue	494	5.0	17	0.2	511	2.9
11	East Range Flat	8	0.1	71	0.9	79	0.4
13	East Range Flecked	23	0.2	234	3.0	257	1.5
14	Fort Hood Gray	19	0.2	18	0.2	37	0.2
15	Gray-Brown-Green	113	1.1	302	3.9	415	2.3
16	Leona Park	1	<0.1	24	0.3	25	0.1
17	Owl Creek Black	55	0.6	293	3.8	348	2.0
18	Cowhouse Two Tone	7	0.1	0	0.0	7	0.0
19	Cowhouse Dark Gray	33	0.3	15	0.2	48	0.3
20	Cowhouse Shell Hash	1	<0.1	0	0.0	1	0.0
21	Cowhouse Light Gray	0	0.0	0	0.0	0	0.0
22	Cowhouse Mottled with Flecks	0	0.0	1	0.0	1	0.0
23	Cowhouse Banded and Mottled	0	0.0	0	0.0	0	0.0
24	Cowhouse Fossiliferous Light Brown	0	0.0	0	0.0	0	0.0
25	Cowhouse Brown Flecked	0	0.0	0	0.0	0	0.0
26	Cowhouse Streaked	1	<0.1	0	0.0	1	0.0
27	Cowhouse Novaculite	0	0.0	0	0.0	0	0.0
28	Table Rock Flat	4	<0.1	0	0.0	4	0.0
29	Indeterminate White	1,204	12.1	391	5.1	1,595	9.0
30	Indeterminate Yellow	52	0.5	20	0.3	72	0.4
31	Indeterminate Mottled	28	0.3	12	0.2	40	0.2
32	Indeterminate Light Gray	621	6.2	678	8.8	1,299	7.3
33	Indeterminate Dark Gray	291	2.9	551	7.1	842	4.8
34	Indeterminate Light Brown	3,959	39.8	1,138	14.7	5,097	28.8
35	Indeterminate Dark Brown	695	7.0	441	5.7	1,136	6.4
36	Indeterminate Black	103	1.0	174	2.2	277	1.6
37	Indeterminate Blue	4	<0.1	1	0.0	5	0.0
38	Indeterminate Red	58	0.6	84	1.1	142	0.8
Totals		9,937	100.0	7,742	100.0	17,679	100.0

(n = 468, 4.7 percent) constitutes only a small percentage. Macroflake and blade blanks are scarce (n = 13, 0.1 percent; n = 2, less than 0.1 percent). A total of 2,024 (20.4 percent) of the debitage could not be assigned to the above flake type categories.

The combined sample of debitage from NRHP-eligible sites probably represents an amalgam of behaviors related to lithic technology. With this in mind, the patterns described above suggest the manufacture of primarily bifacial tools, less emphasis on late stage reduction and the production of finished tools, and a greater manifestation of the early and perhaps middle stages of reduction. Biface manufacture probably began from prepared or largely decorticate blanks that were most likely large flake blanks rather than nodular cores. The low number of macroflake blanks suggests that much of the reduction associated with the production of these blanks from cores occurred elsewhere.

All of the debitage from the NRHP-ineligible sites also is fine-grained chert. One-half (n = 1,988, 50.6 percent) of the 3,932 specimens could be assigned to the 28 identified chert types, while 1,944 specimens (49.4 percent) could be assigned only to indeterminate chert types (see Table 44). The largest quantities are in Type 8 (FHY, n = 1,346, 34.2 percent), Type 15 (GBG, n = 163, 4.1 percent), Type 17 (OCB, n = 111, 2.8 percent), and Type 13 (ER-Flecked, n = 106, 2.7 percent).

Specimens smaller than or equal to ½ inch constitute as large a percentage of this sample (n = 2,729, 69.4 percent) as the sample from eligible sites. Specimens measuring between ½ and 1 inch constitute one-quarter of the sample (n = 978, 24.9 percent). Debitage larger than 1 inch constitutes only 5.7 percent of the sample (n = 225). A large majority (n = 3,171, 80.6 percent) of the debitage is entirely decorticate (i.e., tertiary); entirely corticate debitage makes up only 1.9 percent (n = 74) of the specimens. Specimens with less than 50 percent cortex are more common (n = 554, 14.1 percent) than those with 51–99 percent cortex (n = 133, 3.4 percent).

Fewer solid conclusions can be drawn from the less detailed analysis of debitage from NRHP-ineligible sites. Reiterating the earlier cautions, this debitage sample suggests flake removals from small to medium-sized decorticate cores and/or blanks. The differences in the breakdowns of typed cherts indicate that some different chert sources might have been exploited compared to those accessed from the eligible sites.

GROUND/BATTERED STONE ARTIFACTS

Fourteen ground/battered stone artifacts include five manos, five metates, three hammerstones, and one indeterminate ground stone fragment (Table 45). The five manos are rounded to oval specimens with traces of use wear on both faces. Three (60 percent) are fine-grained quartzite fragments, and one (20 percent) is a complete rounded limestone specimen (Figure 79*a*). It measures 93 mm in length, 79 mm in maximum width, and 32 mm in maximum thickness, and it weighs 344 g. The fifth mano is a somewhat unusual fine-grained chert specimen (Figure 79*b*) with heavy crushing along the edges and in the center of one face and grinding wear on the opposite face. This crushing probably derives from the use of the mano as a crusher during the early stages of grinding in a shallow basin and/or slab metate. It measures 104 mm in length, 81 mm in maximum width, and 44 mm in maximum thickness, and it weighs 523 g. Only one of the mano fragments is complete enough to obtain a maximum width measurement (61.0 mm), while the five specimens range in maximum thickness from 39 to 35 mm (mean = 37.0 ± 2.0 mm).

Table 45. Distribution of ground/battered stone artifacts by site and analysis unit

Site, Analysis Unit	Manos	Metates	Hammerstones	Indeterminate	Totals
41BL69, Shelter A	2	–	–	1	3
41BL155, North Terrace	1	2	–	–	3
41BL582, Shelter A	1	1	–	–	2
41BL827	–	2	3	–	5
41CV1549	1	–	–	–	1
Totals	5	5	3	1	14

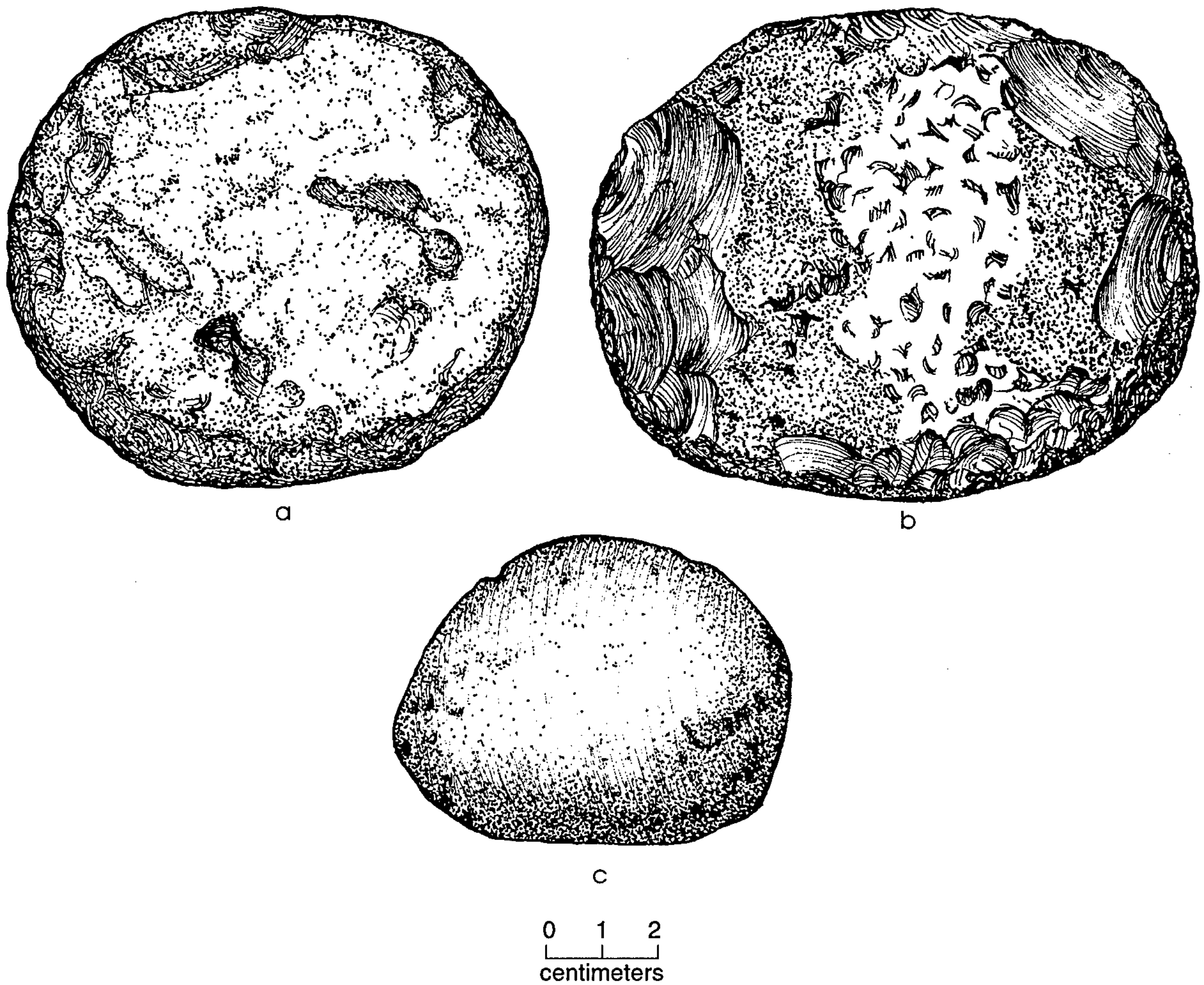

Figure 79. Ground and battered stone artifacts. (*a*) Limestone mano (41CV1549); (*b*) chert mano (41BL155); (*c*) quartzite hammerstone (41BL827).

Two small to medium-sized pebbles and a small pebble fragment have battering characteristic of hammerstones. One of the complete specimens is a small, fine-grained quartzite pebble with scattered battering along its edges (Figure 79*c*); it is 64 mm long, 47 mm wide, and 36 mm thick, and it weighs 158 g. The other, larger specimen is limestone and exhibits battering on its ends. It is 104 mm long, 67 wide, and 42 mm thick, and it weighs 387 g. The pebble fragment is too fragmentary to allow measurement.

All five metates are fragmentary. Four are large tabular limestone pieces, while the remaining specimen is a sandstonelike material, i.e., an oölitic lime-grainstone or lime wackestone (Figure 80), that supposedly is not available within the boundaries of Fort Hood. All five metates exhibit unifacial use wear. Two of the five are basin metate fragments; the others have relatively flat working surfaces. The five specimens range from 30 to 81 mm in maximum thickness (mean = 52.0 ± 24.5 mm).

The last ground/battered stone specimen is a small, fine-grained quartzite fragment that exhibits some pecking, reminiscent of surface rejuvenation, on one face. It is too small to determine whether it is a mano or metate fragment, although the raw material type suggests a mano.

BURNED ROCKS

All sites but 41BL816 and 41CV1348 yielded burned rocks; all were local limestones. Except

Figure 80. Sandstonelike metate, 41BL155.

for specimens that exhibited some form of intentional modification (e.g., ground surfaces), the burned rocks were analyzed and discarded in the field. They were sorted into groups according to rock type (angular, tabular, slab, or cobble), and the total weight of each group was recorded.

The distributions of the burned rocks within sites seem to be related primarily to the presence or absence of discrete heating/cooking features. In some instances, burned rocks scattered within a cultural zone were not sufficiently concentrated or patterned to be recognizable as features (e.g., cultural zones at 41CV1478 and 41CV1479), but most of the burned rocks were found in feature contexts. With the exception of two features of unburned rocks (i.e., Feature 3 at 41CV1480 and possibly Feature 1 at 41BL581), all of the other documented rock features (n = 21) were composed entirely or primarily of burned rocks. Functional inferences relating to burned rock features are discussed in Chapter 8.

VERTEBRATE FAUNAL REMAINS

The vertebrate faunal remains recovered include unmodified and modified bones. As used here, unmodified bones refer to bones that have been unintentionally altered by human activities (e.g., incidental burning or cut marks during butchering). Modified bones refers to specimens that were modified in the process of using the

bone as a tool (i.e., use wear on an expedient bone tool) or were intentionally modified to serve as a tool or ornament. Unmodified bones are described collectively; modified specimens are described individually. The faunal remains were analyzed differently depending upon whether they are from contexts recommended as being eligible or not eligible for listing in the NRHP; they are summarized in Tables 46 and 47.

Unmodified Bones

All vertebrate faunal remains encountered during excavations, with the exception of human skeletal remains or animal bones from completely disturbed levels, were collected. Animal bones were recovered from 17 of the 19 sites. No bones were recovered from 41BL816, perhaps due to inadequate preservation. Poor preservation may also account for the absence of bones at Shelter 2, 41CV1348. No faunal remains were collected from 41BL69 because all bones in Shelter A were found in disturbed contexts (i.e., pothunter's backdirt), and excavations were terminated when an intact human burial was encountered in Shelter B.

Vertebrate remains recovered from sites (or subareas) recommended as eligible for the NRHP were analyzed more intensively than materials recovered from sites recommended as ineligible. Faunal assemblages recovered from NRHP-ineligible sites were analyzed in-house to obtain basic information on frequency of occurrence by provenience along with broad characterizations of the assemblage associated with each analysis unit. The primary objective was to characterize the amount, condition, and general types of bones in each analysis unit without spending excessive time on minimally interpretable faunal assemblages.

Species identification was not attempted for the faunal remains recovered from ineligible sites, but the bones were quantified by size into four broad categories as follows: large (cow/bison sized), medium (deer to jackrabbit sized), small (cottontail rabbit and smaller), and indeterminate. No attempt was made to sort materials by completeness (i.e., complete elements vs. fragments) or to differentiate unidentifiable fragments from identifiable elements. The numbers of burned (charred and/or calcined) bones and the numbers with possible cut marks were listed, as was an assessment of the overall condition of the bones.

The vertebrate remains recovered from NRHP-eligible sites were submitted to Barry Baker (Zooarcheology Laboratory, Texas A&M University) for analysis and are described in more detail in Appendix C. Baker examined 1,433 specimens from 10 sites and identified at least 18 taxa. Because the samples are so small, individual site assemblages are not particularly interpretable. In some cases, the animal bones were definitely deposited and/or modified by cultural activities; in other cases, particularly in the rockshelters, the faunal assemblages probably represent materials introduced and altered by both cultural and natural processes. Collectively, the remains indicate that faunal assemblages are quite variable and moderately to well preserved in some rockshelters and open sites; large, well-preserved assemblages (with over 100 specimens) were recovered from open sites 41BL155, 41CV722, 41CV1478, 41CV1479, and 41CV1482, and from Shelter B at 41BL582, and the rockshelter at 41BL827. Faunal remains from the ca. 10,000-year-old lower shelter deposits at 41BL581 are of particular interest because of possible cultural alterations of two burned bones; also, one specimen is identified as muskrat, a species that no longer lives in the area.

Modified Bones

Three modified bone artifacts were identified by Barry Baker during the analysis of faunal remains from NRHP-eligible sites (see Appendix C); no modified bone artifacts were recovered from the NRHP-ineligible sites.

Two specimens are from 41CV1478. One specimen found at 190–200 cm in Test Unit 3 consists of 12 refit long bone shaft fragments of a medium-sized mammal that exhibit parallel wear striations along the length of the bone. Some of the fragments exhibit striations and polish, and two fragments have a rounded edge that may have been cut by the groove-and-snap method. The other specimen, discovered at 200–210 cm in Test Unit 1, is a left tibiotarsus of a large hawk-sized bird. The tubular bone section (120 cm long and 11.5 cm wide) has a cut groove around its circumference that represents a ring-and-snap cut. It may have been intended for manufacture into a bead.

The third specimen, found at 200–210 cm in

Table 46. Summary of vertebrate faunal remains from NRHP-ineligible sites

	Number of specimens							
Site, Subarea, Shelter	Large	Medium	Small	Indeterminate	Totals	Number Burned	Number Cut	Assessments and comments
41BL69, Shelter A	–	–	–	–	–	–	–	good; no collections*
41BL181	0	16	4	4	24	12	0	poor; very fragmentary
41BL579, Shelter B	0	1	0	0	1	0	0	good
41BL579, Shelter C	0	3	6	0	9	0	0	poor-variable; gnawing observed
41BL667	0	86	15	33	134	44	1	very poor; gnawing observed; deer and canine present
41BL816	0	0	0	0	0	0	0	
41CV944, Shelter A	0	35	28	5	68	19	2	variable; gnawing observed; deer present
41CV944, Shelter B East and West	0	15	25	8	47	1	0	variable; gnawing observed; deer present
41CV1348, Shelter 1	0	0	5	3	8	2	0	poor; gnawing observed
41CV1348, Shelter 2	0	0	0	0	0	0	0	none
41CV1473	0	0	0	1	1	0	0	very poor
41CV1487	0	0	0	2	2	0	0	poor

*Faunal remains were present but not collected because all cultural deposits were disturbed.
Assessment of condition:
good = minimal evidence of weathering/deterioration
poor = abundant evidence of weathering/deterioration; bones badly fragmented
very poor = minimal or no faunal recovery probably due to poor bone preservation
variable = condition varies from poor to good

Table 47. Summary of vertebrate faunal remains from NRHP-eligible sites

Site, Subarea, Shelter	Number burned	Number with spiral fractures	Number cut	Number modified	Totals*
41BL155	29	48	0	0	156
41BL581, Shelter B	2	15	0	0	61
41BL582, Shelter A	8	7	0	0	132
41BL827	80	85	0	0	245
41CV722	28	28	2	0	118
41CV1478	14	28	1	2	180
41CV1479	40	65	1	1	303
41CV1480	1	0	0	0	34
41CV1482	12	41	0	0	148
41CV1549	8	17	0	0	56
Total	222	334	4	3	1,433

* Includes 3 modified bone artifacts.

Test Unit 2 at 41CV1479, is a bone awl made from a left deer ulna. Its proximal end is broken, but it has an intact trochlear notch and coronoid process. The distal end of this 76-mm-long specimen tapers to a point at ca. 40 mm from the trochlear notch, and it is striated and/or polished.

INVERTEBRATE FAUNAL REMAINS

Invertebrate faunal remains recovered include shells of freshwater mussels and land snails. These two classes of invertebrates are discussed separately because their occurrences are thought to be related to different processes. Mussel shells are considered to be cultural introductions in most archeological contexts, while snail shells occur naturally. As discussed in Chapter 4, collection of mussel shells was limited to pieces of bivalves containing the umbo or shell fragments exhibiting intentional cultural modifications (Table 48). Samples of snail shells were collected from selected contexts.

Unmodified mussel shells are generally interpreted as waste products of food procurement in most contexts. Evidence of burning reflects intentional heating to open the shell or accidental heating. Specimens exhibiting cut edges or drilled holes, however, are interpreted as having been intentionally modified in the process of manufacturing shell ornaments.

Unmodified Mussel Shells

Each collected shell was analyzed for the three key attributes of completeness, thermal alteration, and modification. Of the 2,540 freshwater

Table 48. Summary of mussel shells recovered

Site, Subarea, Shelter	All mussel shells*	Complete shells	Burned shells	Modified shells
41BL69, Shelter A	634	324	57	3
41BL181	1	0	0	0
41BL579, Shelter C	1	0	0	0
41BL581	1	0	0	0
41BL582, Shelter A	22**	1	0	0
41BL667	22	7	4	0
41BL827	42	16	9	0
41CV722	17	1	0	0
41CV1348, Shelter 1	1	0	0	0
41CV1478	613	230	35	3
41CV1479	164	36	25	0
41CV1480	107	31	5	0
41CV1482	722	62	18	1
41CV1487	133	0	0	0
41CV1549	60	1	0	0
Totals	2,540	709	153	7

* Includes 7 modified shell artifacts.
** All shells are tufa encrusted.

mussel shells collected from 15 prehistoric sites, only 7 (less than 0.3 percent) exhibit intentional cultural modifications (see Modified Mussel Shells below). Only 6 percent (n = 153) exhibit evidence of burning. Most shells are valve fragments (72 percent), and burning is more frequently evident on these than on the complete specimens. Most of the complete valves that exhibit evidence of heating appear to have been burned unintentionally. Evidence of burning does not occur primarily along the hinges where it would be expected if heat was used to open the shells to extract the mussels. Consequently, it is likely that the majority of the burned shells were simply discarded into fires.

Many freshwater shell species identifications have been conducted in the past, but little interpretable information has been gained because all previously identified species are from the same living environments. It is logical to assume that the mollusks found in archeological sites were procured from the nearest major stream or river where suitable mussel habitat existed (i.e., Cowhouse Creek and the Leon River). Consequently, formal species identification was not attempted during the current investigations.

Modified Mussel Shells

Seven modified mussels shells were recovered from three sites. These artifacts are interpreted as having been personal ornaments (i.e., jewelry) or waste by-products from the manufacture of ornaments. Three were found in Test Unit 2 within a vandalized talus deposit containing numerous human skeletal remains at 41BL69. Two of these—an upper valve (50x44x3.5 mm) and a lower valve (46x35x2.5 mm)—are complete; each has a single perforated hole drilled from the interior surface. The symmetrical perforation (3 mm in diameter) in the upper valve is located near the distal end of the hinge ligament, while the lower valve perforation (4.5 mm in diameter) is located centrally along its hinge ligament. Although circular in shape, the latter specimen has a small beveled notch extending toward the ligament that most likely formed from suspension wear. The third modified shell from 41BL69 consists of the umbo and anterior section (34x31x5.5 mm) of an upper valve. Although its posterior section is broken, the ventral end appears to have been cut and subsequently ground smooth. One of the complete valves was apparently worn as a pendant. Given their archeological contexts, these shell artifacts most likely represent grave inclusions that were overlooked by vandals.

Three other modified shells were found at 190–200 cm in Test Unit 1 at 41CV1478, within the West Range alluvium. Two of these are anterior halves of lower valves. The larger of the two measures 41x27x2.8 mm, while the smaller is 34x24x3.0 mm. In profile, the umbo portion of the smaller valve has been broken, with the remainder having been cut from the inner to outer surface. A scar located on the exterior surface near the middle of the larger valve appears to be an attempted perforation. The incomplete drill hole traveled approximately 1 to 2 mm into the shell, at which time the boring was aborted or the shell fractured. In either case, the entire length of the shell was subsequently cut from the exterior surface, transecting the midpoint of the perforation. The third specimen, measuring 39x29x5.3 mm, consists of the dorsal half of an upper valve. The anterior end of this valve was cut from the interior, the midsection was cut from the exterior, and the posterior edge is broken off. In profile, the cut edge of this valve is beveled and clearly exhibits a series of stepped cut marks indicating the alternating sides from which the shell was cut.

The seventh modified shell also was found in the West Range alluvium at 41CV1482 (at 100–110 cm in Test Unit 1). This piece consists of a 30x19x3.1-mm ventral segment of an upper valve. The dorsal end was fractured during excavation. A series of stepped cut marks visible in profile indicate that two cuts were made, intersecting at the midpoint of the shell fragment; the front half was cut from the interior, while the proximal section was cut from the exterior.

Snail Shells

Unlike mussel shells which occur in sites as a result of cultural activities, all snail shells recovered are thought to represent natural occurrences. The most ubiquitous species of land snail at Fort Hood throughout the Holocene was *Rabdotus*. Because snail shells can be used for chronometric dating, provide evidence of the integrity of archeological deposits, and yield valuable paleoenvironmental data (e.g., Ellis and

Goodfriend 1994), a sample of snails was collected whenever they were recovered in excavation levels and feature contexts.

Although the geoarcheological and chronological studies of snails are in their infancy, recent research at Fort Hood has focused on amino acid epimerization (Abbott and Trierweiler 1995a; Trierweiler, ed. 1994). In addition, previous researchers have obtained fairly reliable results by directly dating snails using the AMS radiocarbon method. Following this line of investigation, three charcoal samples were paired with unburned *Rabdotus* shells for dating. These paired samples, which were stratigraphically and contextually associated, were collected from the Leon River paleosol at site 41CV1482 (cultural materials within this paleosol were observed in all of the investigated sites within the Leon River drainage basin). The paired charcoal and snail samples were obtained from the top, middle, and bottom of the paleosol. The resulting radiocarbon dates not only provide evidence regarding the rate of deposition of the Leon River paleosol, but they also suggest that the snail dates are generally reliable. The results and implications of the paired charcoal and snail radiocarbon dates from 41CV1482 are discussed in Appendix A.

MACROBOTANICAL REMAINS

Charred plant remains, presumably burned intentionally or accidentally as a result of human activities, were recovered as individual charcoal samples and from flotation of feature and nonfeature sediments. Selected charcoal and flotation samples were submitted to the Paleoethnobotanical Laboratory at Texas A&M University for analysis; the recovery and analyses of macro-botanical remains are discussed in Appendix D. The most important conclusion from these studies is that well-preserved charred plant remains in some sites (particularly Leon River sites 41CV1478, 41CV1479, and 41CV1480) constitute interpretable macrobotanical assemblages, while limited recovery at other sites suggests that macrobotanical assemblages are likely to be poorly preserved and less interpretable in other sites.

INTERPRETATIONS OF ARCHEOLOGICAL AND GEOARCHEOLOGICAL DATA

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Of the 19 investigated sites, 10 are open and 9 sites contain one or more rockshelters. A detailed discussion of the investigations and findings at each site is presented in Chapters 5 (Bell County sites) and 6 (Coryell County sites), and recommendations for National Register eligibility are summarized in Chapter 9. For interpretive purposes, this chapter divides the sites into three categories based on site type and location. Rockshelters are considered separately because of the distinctive nature of the site type. Open sites are divided by location into six sites along the Leon River and four other open sites in different topographic and geomorphic settings.

Cultural materials and features associated with defined analysis units (which approximate cultural components attributable to specific time periods) constitute the evidence for interpreting human behavior. For the 19 tested sites, 35 analysis units are defined. A summary of artifacts recovered from these sites is presented in Table 49, and features are summarized in Table 50.

ROCKSHELTERS

Within the 9 sites where rockshelter investigations were conducted, 15 separate shelters were tested (Shelter B at 41CV944 is actually two separate shelters designated as east and west overhangs). Basic data and interpretations of these rockshelters are summarized in Table 51.

Geomorphic Observations

Based on direct involvement in reconnaissance and intensive survey of more than 150 rockshelters and karst features on Fort Hood and testing of the deposits within many of these natural features, the two senior authors concur with the characterization of rockshelter sediment types originally proposed, and subsequently redefined, by Abbott (1994b:341–346; 1995b:833–837). Types 1 and 2 are endogenously derived silts and spalls, with Type 1 having a homogeneous composition and Type 2 being characterized by multicolored stratified lenses that have been altered by redox reactions to ground water discharge. Types 3 and 4 are exogenously introduced clay loams. The primary distinction is that Type 3 is brown to black while Type 4 is red to reddish brown; these differential colors are a result of erosion of different upland soil horizons and their subsequent redeposition in shelters. Type 5 represents tufa and travertine deposits which have developed from in situ ground water discharge, and Type 6 fill may be either coarse limestone lag gravels from which all fine-grained sediments have been eroded or bare limestone floors from which all sediments have been eroded. Slight modifications later introduced include (1) the potential for Types 1 and 2 to be composed of varying amounts of culturally introduced organics (i.e., ash and charcoal), (2) the potential for Type 3 to contain a considerable amount of internally derived sediments, and (3) the potential for some Type 4 fills to represent in situ Bt horizons formed in endogenous Type 1 or 2 sediments. For the latter, it is the recognition of some degree of pedogenic structure that distinguishes the endogenous Type 4 fill from the exogenous Type 4 fill (Abbott 1995b:833–837).

All of these sediment types were observed within the shelters tested during the current study (see Table 51). Multiple sediment types were identified in just over half of the shelters.

Table 49. Summary of artifacts recovered by site and analysis unit*

Site	Shelter or Analysis Unit	Arrow Points	Dart Points	Perforators	Adzes	Gouge	Knives	Scrapers	Choppers	Gravers	Multifunctional Tools	Miscellaneous Bifaces	Miscellaneous Unifaces	Cores	Unmodified Debitage	Ground Stones	Battered Stones	Modified Bones	Modified Shells	Totals
ROCKSHELTERS																				
41BL69	A	1	0	2	2	0	0	4	0	0	0	6	0	0	679	3	0	0	3	700
41BL181	–	3	4	1	7	0	8	16	3	3	1	6	12	4	3,081	0	0	0	0	3,149
41BL579	B	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	3
41BL579	C	0	0	0	0	0	0	0	0	0	0	0	1	0	32	0	0	0	0	33
41BL581	–	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	2
41BL582	A	0	3	0	0	0	0	1	1	0	0	0	1	0	171	2	0	0	0	179
41BL582	B	0	0	0	1	0	0	0	0	0	0	0	0	0	5	0	0	0	0	6
41BL667	–	10	4	0	1	0	3	2	0	1	0	3	1	6	733	0	0	0	0	764
41BL827	–	11	3	1	1	0	2	11	0	0	0	5	13	3	2,093	2	3	0	0	2,148
41CV944	A	8	2	0	0	0	1	6	0	1	0	2	6	2	935	0	0	0	0	963
41CV944	B (east)	0	0	0	0	0	1	0	0	0	0	0	0	0	74	0	0	0	0	75
41CV944	B (west)	0	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	0	5
41CV1348	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
41CV1348	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotals	–	34	16	4	12	0	15	41	4	5	1	23	34	15	7,811	7	3	0	3	8,028
LEON RIVER SITES																				
41CV1473	1	2	1	0	0	1	14	18	0	2	1	7	14	7	2,149	0	0	0	0	2,217
41CV1478	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
41CV1478	2	0	0	1	0	0	0	5	0	0	0	0	1	1	53	0	0	2	3	66
41CV1478	3	0	0	0	0	0	0	1	0	0	0	0	0	0	24	0	0	0	0	25
41CV1479	1	0	0	0	0	0	0	0	0	0	0	1	0	0	6	0	0	0	0	7
41CV1479	2	2	0	0	0	0	0	1	0	0	0	0	0	0	25	0	0	1	0	29
41CV1480	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2
41CV1482	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41CV1482	2	1	2	0	0	0	0	2	1	0	0	3	2	1	112	0	0	0	1	125
41CV1482	3	0	1	1	0	0	1	3	0	0	0	1	3	0	166	0	0	0	0	176
41CV1487	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41CV1487	2	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	9
Subtotals	–	5	4	2	0	1	15	30	1	2	1	12	20	9	2,548	0	0	3	4	2,658

*Excludes 33 flakes deleted from unmodified debitage due to coding errors.

Table 49, continued

Site	Shelter or Analysis Unit	Arrow Points	Dart Points	Perforators	Adzes	Gouge	Knives	Scrapers	Choppers	Gravers	Multifunctional Tools	Miscellaneous Bifaces	Miscellaneous Unifaces	Cores	Unmodified Debitage	Ground Stones	Battered Stones	Modified Bones	Modified Shells	Totals
OTHER SITES																				
41BL155	1	0	28	4	13	0	34	89	6	5	3	38	77	8	6,337	3	0	0	0	6,645
41BL155	2	0	0	0	1	0	0	1	0	0	0	0	0	2	17	0	0	0	0	21
41BL816	–	0	1	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	0	39
41CV722	1	3	3	0	0	0	0	4	0	1	0	1	1	1	317	0	0	0	0	331
41CV722	2	1	2	0	0	0	0	4	1	0	0	1	0	2	87	0	0	0	0	98
41CV722	3	4	1	0	0	0	1	5	2	0	0	4	0	0	167	0	0	0	0	184
41CV1549	1	0	0	0	0	0	1	0	0	0	0	0	0	0	70	0	0	0	0	71
41CV1549	2	0	1	0	0	0	6	2	0	0	0	1	0	0	287	1	0	0	0	298
Subtotals	–	8	36	4	14	0	42	105	9	6	3	45	78	13	7,320	4	0	0	0	7,687
Totals		47	56	10	26	1	72	176	14	13	5	80	132	37	17,679	11	3	3	7	18,373

Table 50. Summary of tested features by site and analysis unit

Site	Shelter/ Analysis Unit	Feature No.	Landform/ Geomorphic Setting	Feature Type	Test Unit[1]	Depth (cm)	Dimensions (m) excavated	Dimensions (m) estimated	Calibrated Radiocarbon Date, B.C./A.D.[2]
ROCKSHELTERS									
41BL69	B	1	inside shelter	human burial	3	32+	NA	not estimated	–
41BL581	B	1	inside shelter	burned rock concentration	1, 2	40–70	2x1	17x4	–
41BL582	A	1	inside shelter	burned rock concentration	2	30–40	1x0.70	3.5x3.5	785 (760, 672, 665, 632, 592, 584, 560) 427 B.C.
41BL827	–	2	shelter talus	burned rock midden	3	0–70	1x1	16x8	A.D. 1251 (1286) 1303
LEON RIVER SITES									
41CV1473	1	4	T_2; Leon River	burned rock concentration	1	0–20	1x1	9x4	–
41CV1478	3	1	T_1; Turnover Creek	flat angular rock hearth	2, 3	165–180	0.56x0.36	0.56x0.36	A.D. 124 (222) 315
41CV1479	2	1	T_1; Turnover Creek	rock-filled depression	1	130–249	0.78x0.73	not estimated	A.D. 1052 (1195) 1248
41CV1480	1	1	T_0/T_1; Leon River	basin-shaped hearth (very little burned rock)	1	160–180	0.55x0.35	0.80x0.80	A.D. 1433 (1454) 1621
41CV1480	1	2	T_0/T_1; Leon River	basin-shaped hearth (angular burned rock)	1	160–173	0.42x0.22	0.75x0.75	–
41CV1480	1	3	T_0/T_1; Leon River	mussel shell lens	2	219–263	1x1	6x3	–
41CV1482	2	1	T_1; Leon River	flat angular rock hearth	1, 3	96–109	0.90x0.80	1.8x0.80	A.D. 898 (997) 1023
41CV1482	3	2	T_1; Leon River	basin-shaped hearth (angular rock)	2	127–139	0.45x0.35	0.45x0.35	–
41CV1482	3	3	T_1; Leon River	basin-shaped hearth (angular rock)	1	126–133	0.50x0.44	1x0.44	A.D. 71 (130) 235
OTHER OPEN SITES									
41BL155	1	1	T_1; tributary of North Nolan Creek	burned rock midden	1, 2, 3, 5	0–50	3x1	90x30	–
41BL155	1	2	T_1; tributary of North Nolan Creek	slab-lined basin shaped hearth	2, 5	16–50	1.5x1	1.5x1.5	751 (407) 395 B.C.
41CV722	1	2	distal end of colluvial deposits	burned rock concentration	10	21–32	1x1	not estimated	–
41CV722	2	1	alluvium along valley axis	flat angular rock hearth	3	15–35	1x1	not estimated	A.D. 248 (397) 532
41CV722	2	3	alluvium along valley axis	burned rock concentration	11	37–59	1x0.90	2.75x2.0	A.D. 552 (619) 654

Table 50, continued

Site	Shelter/ Analysis Unit	Feature No.	Landform/ Geomorphic Setting	Feature Type	Test Unit	Depth (cm)	Dimensions (m) excavated	Dimensions (m) estimated	Calibrated Radiocarbon Date, B.C./A.D.
OTHER OPEN SITES, continued									
41CV722	1	4	distal end of colluvial deposits	burned rock midden	12	0–35	0.50x0.50	8x4	A.D. 1307 (1400) 1421
41CV1549	2	2	T_1; Cowhouse Creek	basin shaped hearth (angular rock)	1	86–95	0.54x0.48	0.90x0.80	A.D. 427 (538) 596
41CV1549	2	3	T_1; Cowhouse Creek	basin shaped hearth (angular rock)	3	147–162	0.54x0.28	0.55x0.55	761 (511, 435, 428) 403 B.C.
41CV1549	1	4	T_0; Cowhouse Creek	burned rock concentration	2	190–200	0.70x0.50	1x0.80	A.D. 779 (883) 967
41CV1549	2	5	T_1; Cowhouse Creek	burned rock concentration	5	46–62	0.94x0.76	1x1	–

[1] Units where feature was encountered
[2] 1-sigma range with intercepts from Appendix A

Table 51. Summary of tested rockshelters

Site, Shelter	Opening orientation	Shelter dimensions (m)	Shelter area (m^2)	Talus area (m^2)	Number of test units	Depth of shelter deposits (cm)	Sediment types observed	Temporal/cultural period of occupation
41BL69, Subarea A	E	17x3.5x1.7	59.5	59.5	3	150	1	Late Prehistoric
41BL69, Subarea B	E	20.4x5x3.9	102	–	1	50	1	late Holocene (?)
41BL181	S	15.6x8.8x2.7	137.3	180	3	110	1, 3, 4	Late Archaic-Late Prehistoric
41BL579, Subarea B	S	11x4x5	44	–	2	40	1, 4	Late Prehistoric
41BL579, Subarea C	S	47x5x6.5	235	–	2	60	1, 6	late Holocene (?)
41BL581, Subarea B	N	30x5x2.6	150	–	2	90	2, 4	early Paleoindian
41BL582, Subarea A	E	7x4.7x4.8	32.9	30	2	80	1, 5	Late Archaic
41BL582, Subarea B	S	10x2x2.8	20	–	1	50	3	late Holocene (?)
41BL667	E	11x3x3.5	33	48	3	90	1, 3	Late Archaic-Late Prehistoric
41BL827	E	12x2x1.4	24	128	4	90	2, 5	Late Prehistoric
41CV944, Subarea A	S	19x5.4x8	102.6	–	3	40	1	Late Archaic-Late Prehistoric
41CV944, Subarea B East	S	23x7x6	161	–	2	70	1	late Holocene (?)
41CV944, Subarea B, West	S	14x3x3	42	–	1	50	1	late Holocene (?)
41CV1348, Shelter 1	N	16x5x1.5	80	–	2	80	1, 3	late Holocene (?)
41CV1348, Shelter 2	NE	14x2x1	28	–	1	50	3	late Holocene (?)

Type 1 sediment was observed in 11 (73.3 percent) shelters and is by far the most common type; Types 2 and 5 were observed within 2 of the shelters, and Type 6 was observed in 1 shelter only. Types 3 and 4, or a combination thereof, were observed in 7 shelters. The Type 4 deposits within 41BL181 and Shelter B at 41BL579 are interpreted as structureless and externally derived, while those within Shelter B at 41BL581 represent a Bt horizon (with a pronounced blocky structure) that formed through extensive weathering of Type 1 fill. The calibrated radiocarbon date of 9708–9059 B.C. obtained on charcoal from the Bt horizon indicates that the lower shelter deposits were present in early Paleoindian times. This charcoal date is from the upper portion of the Bt horizon and is underlain by approximately 40 cm of sediments which could be of even greater antiquity. Compared with other shelters at Fort Hood, Shelter B at 41BL581 is unique in that the sediments are trapped behind a large roof spall block that spans the shelter's mouth and serves as a protecting barrier against erosion (see Figure 22).

Thoms and Olive (1993:56) note that rockshelters in Central Texas were occupied most frequently and most intensively in the Late Archaic and Late Prehistoric periods, although Paleoindian to Middle Archaic occupations also are preserved in some cases. For the Fort Hood area, they suggest that the increased use of rockshelters evident in Late Prehistoric times is the result of climatic changes and changing settlement and subsistence patterns. Noting the lack of appreciable older deposits below late Holocene cultural strata in most Fort Hood rockshelters, Abbott (1995b:837) suggests that (1) sediments predating the late Holocene were scoured from most shelters as a result of increased groundwater discharge following the dry Altithermal period, and/or (2) the majority of occupied rockshelters did not develop into habitable features until late Holocene times. Hence, the archeological records in rockshelters would be biased to the later periods. These hypotheses are difficult to test in the absence of earlier rockshelter deposits. However, the dating of organic materials by radiocarbon assay from more-resistant travertine and tufa deposits may provide insight into whether the rockshelters are recent, short-lived features on the landscape or are much older features that have been periodically flushed of deposits (Abbott 1995b:838).

Cultural Observations

Cultural materials were recovered from all but two shelters (see Table 49). No cultural materials were recovered from Shelter 2 at 41CV1348, and although cultural materials were observed during excavations in Shelter B at 41BL69, no collections were made due to the discovery of an intact human burial.

In an analysis of 14 tested rockshelters on Fort Hood, Abbott (1995b:823–833) presents three important preliminary cultural observations. First, large artifact assemblages recovered from some shelters suggest longer and/or more intense occupations than are evident in shelters with small artifact assemblages. Also, shelters with smaller assemblages were found to have a higher tool to debitage ratio than shelters with large assemblages, suggesting that tool production and maintenance occurred away from the former shelters but on-site in the latter shelters (although lower frequencies of cores were evident for shelters containing high frequencies of debitage). Finally, temporal data indicate that most shelter deposits with evidence of human occupation date mainly to the Late Archaic and Late Prehistoric periods.

The pattern of high vs. low density shelters and the proposed relationship of increasing numbers of tools coinciding with decreasing amounts of debitage is generally evident (Table 52). The shelters can be divided into two groups—those with small artifact assemblages (artifact densities of less than 100 chipped stones per m^3) and those with large artifact assemblages (artifact densities of over 100 chipped stones per m^3). Recovery of chipped stone artifacts was relatively low from eight of the shelters, ranging in density from less than 1 to 68 chipped stone tools per m^3. Actual recovery ranged from a single flake recovered at Shelter 1, 41CV1348 to 74 pieces of debitage and 1 tool from the east overhang of Shelter B, 41CV944. Since artifact density is a crude measure of total use intensity, these shelters most likely were occupied very briefly and/or intermittently, with limited activities performed by the occupants. Numerous tools and moderate to large amounts of debitage were recovered from the other six shelters, despite the fact that the tool/debitage ratio and artifact density for 41BL181 are skewed by

Table 52. Summary of chipped stone artifacts recovered from rockshelters

Site	Shelter	Chipped stone tools	Cores	Unmodified debitage	Tool to debitage ratio	Total volume excavated (m^3)	Artifact density per m^2
41BL69	A	15	–	679	1:45	2.3	302
41BL181*	–	64	4	3,081	1:48	2.3	1,368
41BL579	B	1	–	2	1:2	0.5	6
	C	1	–	32	1:32	1.0	33
41BL581	B	1	–	1	1:1	1.7	1
41BL582	A	6	–	171	1:29	1.5	118
	B	1	–	5	1:5	0.5	12
41BL667	–	25	6	733	1:29	2.1	364
41BL827	–	47	3	2,093	1:45	2.2	974
41CV944	A	26	2	935	1:36	0.9	1,070
	B-East	1	–	74	1:74	1.1	68
	B-West	1	–	4	1:4	0.5	10
41CV1348	1	–	–	1	0:1	1.3	<1
	2	–	–	–	0	0.5	<1

*The tool to debitage ratio (overestimated) and the artifact density (underestimated) are not accurate because only diagnostic tools were collected from the upper 50 cm of vandalized deposits in Test Unit 1.

collection of only diagnostic artifacts from the upper 50 cm of vandalized deposits in Test Unit 1. The artifact densities for these six shelters range from 118 to 1,368 chipped stone specimens per m^3. In addition to producing larger quantities of chipped stones, ground and battered stone artifacts also were found at three of these sites (see Table 49). In contrast to the findings of the previous analysis (Abbott 1995b), cores were found to be most common in shelters with high frequencies of debitage (this apparent discrepancy may be due, at least in part, to differences in the definitions and/or recognition of cores between this study and Abbott's [1995b] analysis). The combined evidence suggests that a wider range of activities was carried out and that shelter occupations were more intensive and/or spanned a greater period of time within these high artifact density shelters.

No strong correlation seems to exist between shelter size and artifact density. The size of the sheltered area (the number of m^2 behind the dripline, regardless of whether intact sediments are present or not) and the size of any associated occupiable talus area (the number of m^2 of any fairly level adjacent area with evidence of occupations) were combined to determine the size of the total occupiable area for each shelter. When the artifact densities and sizes of the occupiable areas are compared for the 14 tested rockshelters, only one general trend is evident (Figure 81). Bearing in mind that the data are tenuous due to the limited nature of the test excavations, the four smallest shelters (i.e., those with a total occupiable area of less than 50 m^2) exhibit very low artifact densities that should be indicative of ephemeral use. Eight slightly larger shelters (i.e., those with total occupiable areas of 50 to ca. 175 m^2), however, vary considerably in the apparent intensity/duration of their occupations; two shelters have very low artifact densities, four have moderate densities, and two have extremely high densities. Not surprisingly, the largest shelter exhibits evidence of very intensive use. In contrast, the second largest shelter has an extremely low artifact density, indicating only ephemeral use. Thus, while the data suggest a general tendency for larger rockshelters to have been utilized intensively, there are exceptions. The evidence suggests that there are probably many other less tangible variables accounting for the apparent differences in rockshelter use intensity. Geomorphic factors may come into play in some cases. For example, a large intensively occupied shelter where significant amounts of deposits were removed by erosion would produce an unrealistically low artifact density. Natural factors, such as accessibility

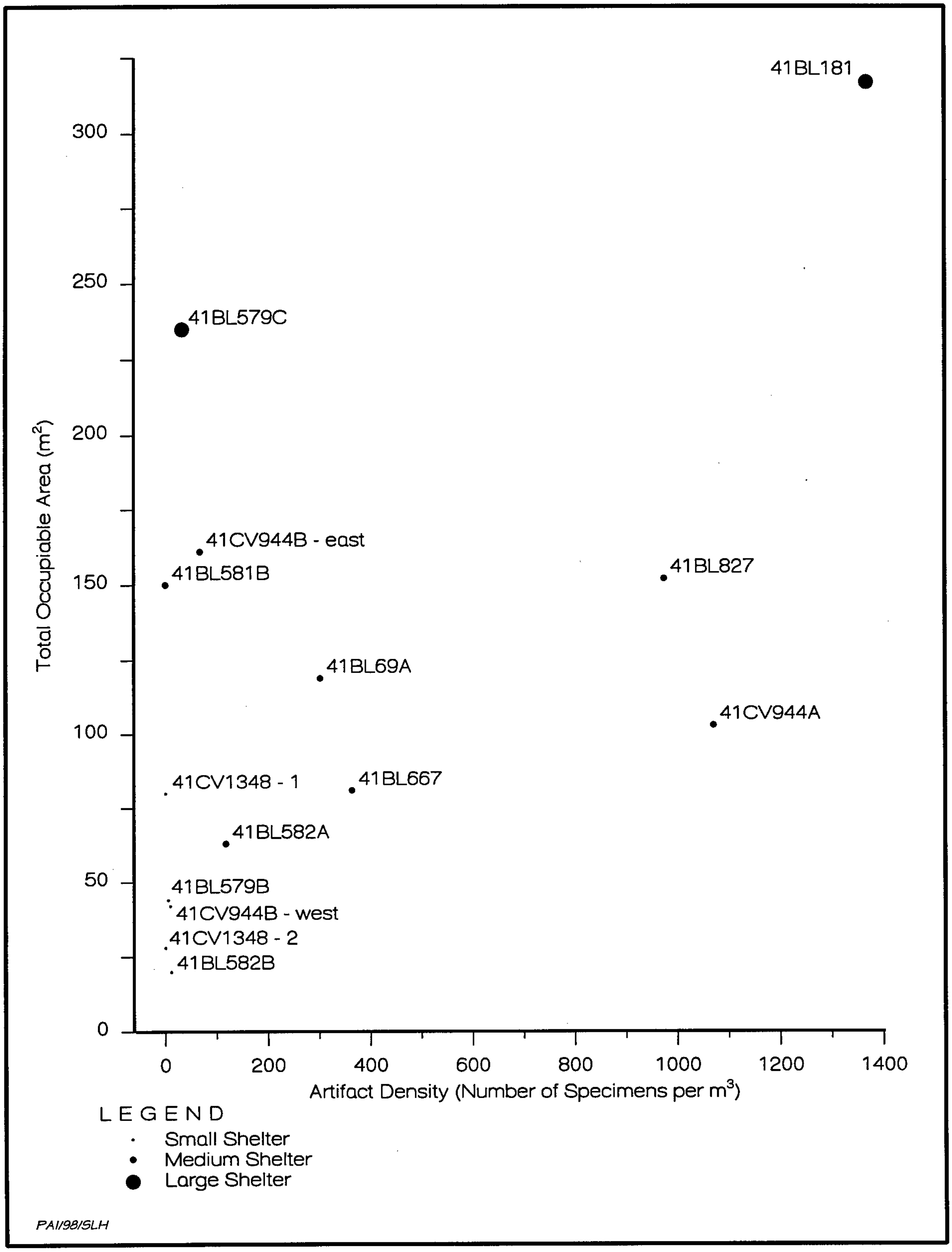

Figure 81. Comparison of artifact density and total occupiable area of tested rockshelters.

to food resources, proximity to rivers or drainages, the presence or absence of seep springs inside or immediately adjacent to shelters, or the size and direction of shelter openings relative to changing seasonal conditions may have been important characteristics that made certain rockshelters more desirable for long-term habitation than others. Long-term research goals for investigating Central Texas rockshelters should include detailed attribute analyses that might discover important characteristics affecting cultural uses of rockshelters.

The faunal assemblages recovered from three rockshelters are reported in Appendix C. The animal bones from 41BL581 (n = 61), 41BL582, Subarea A (n = 132), and 41BL827 (n = 245) represent a wide range of species, although it is difficult to determine naturally vs. culturally introduced bones in rockshelters, especially when recovered during limited testing. Some of the remains are likely to be intrusive (e.g., the pitted carnivore bones). On the other hand, many of the animals represented, including birds, all sizes of mammals, rabbits, various rodents, muskrat, canids, bobcat, deer, and possibly antelope and bison, may have been killed and used by humans. No bones from these three rockshelters exhibit cut marks, but spiral fractures were observed on 5 to 35 percent of the remains. In addition, evidence of burning was observed on 6 to 33 percent of the bones. Elements showing evidence of gnawing are fairly common (23 percent) in the upper levels at 41CV581 and are likely to be intrusive; however, the faunal assemblage from the lower levels of this site is interesting because of its great antiquity, and it is discussed in detail in Appendix C.

Six hundred thirty-four unmodified mussel shells and three shell artifacts were recovered from Shelter A at 41BL69. This accounts for 89 percent of all the unmodified shells and 100 percent of all the shell artifacts recovered from the rockshelters (see Table 49). The most plausible explanation for this anomaly is that, because this shelter is located near the confluence of two major streams, the inhabitants exploited mussels more intensively as a food resource. Although much of the shell debris may result from subsistence activities, the modified specimens indicate that shells were used for ornamental and/or utilitarian (i.e., scraping) purposes as well. Furthermore, the abundance of human remains in the vandalized deposits in Shelter A (discussed below) suggests that modified shells may have been included as grave offerings in burials that have since been destroyed.

Four features were identified in the test excavations at rockshelters (see Table 50). One is the human burial found in Shelter B at 41BL69, one is a burned rock "talus" midden at 41BL827, and two are burned rock concentrations at Shelter B at 41BL581 and Shelter A at 41BL582. In addition to the intact burial in Shelter B at 41BL69, human bones were found in disturbed contexts in Shelter A at 41BL69 and Shelter A at 41BL667. All cultural deposits within the latter two have been virtually obliterated as a result of vandalism. In addition, cultural deposits at 41BL181 have been largely destroyed by pothunting activities, and vandalism has seriously impacted, although to a lesser degree, the cultural deposits in four other shelters (41BL827 and Shelters A, B-East, and B-West at 41CV944). With the exception of Shelter B-West at 41CV944, dispersed burned rocks were found in all of the vandalized shelters. Therefore, the low incidence of identifiable, intact features within the rockshelters is largely attributed to the high frequency of disturbed deposits. Although burned rock middens also are frequently targeted by pothunters, the rockshelters on Fort Hood are the most vulnerable type of prehistoric site and have suffered the most serious impacts.

Chronological evidence for occupations of the tested rockshelters includes four radiocarbon dates and 50 projectile points (Table 53). With the exception of the conventional radiocarbon age of 10,010 ± 60 B.P. obtained on charcoal from Shelter B at 41BL581 (discussed below), these temporal data mirror the findings presented by Abbott (1995b:Table 9.14). Of the recovered projectile points, 34 (68 percent) are arrows and 16 (32 percent) are darts. Although the ratio of recovered darts to arrows in this study, 0.5 to 1, is similar to the ratio in the TRC Mariah study (which reports 19 dart points and 32 arrow points for a ratio of 0.6 to 1), the data are perhaps biased to some extent by removal of selected artifacts by vandals. As noted by Dickens (1993a:101), dart points are the most sought after artifacts for most collectors; they are more readily recognized (and less commonly overlooked) than arrow points. All of the dart points classified to type (50 percent) during the

Table 53. Chronological evidence recovered from rockshelters

Site	Shelter	Conventional Radiocarbon Age, B.P.	Arrow points: Bonham	Fresno	Granbury	Perdiz	Scallorn	Untyped	Dart points: Darl	Ensor	Marcos	Marshall	Zephyr	Untyped
41BL69	A	–	–	–	–	–	–	1	–	–	–	–	–	–
41BL181	–	–	–	–	–	–	1	2	–	1	–	1	1	1
41BL579	B	–	–	–	–	–	–	1	–	–	–	–	–	–
41BL581	B	10,010 ± 60	–	–	–	–	–	–	–	–	–	–	–	–
41BL582	B	2,500 ± 60	–	–	–	–	–	–	1	–	–	–	–	2
41BL667	–	–	–	1	–	–	3	6	1	1	–	–	–	2
41BL827	–	710 ± 50 730 ± 70	1	–	1	–	–	9	1	–	1	–	–	1
41CV944	A	–	–	–	1	1	2	4	–	–	–	–	–	2
Totals			1	1	2	1	6	23	3	2	1	1	1	8

current investigation are assigned to Late Archaic styles dating to the latter half of the period (i.e., Marshall, Marcos, Ensor, Darl, and Zephyr [see Figure 4]). This temporal evidence supports the majority of findings concerning rockshelters in Central Texas, which indicate that these natural features were inhabited primarily during the Late Prehistoric and, to a lesser extent, Late Archaic periods. The key question then becomes whether this reflects cultural reality (e.g., more intensive use of rockshelters through time), a serious sample bias due to geomorphic processes (e.g., removal of earlier deposits and sites from the archeological record), or some combination of cultural and natural processes.

LEON RIVER SITES

Within Fort Hood, the Leon River drainage system encompasses a 1.6-km-long section of the river and small portions of two intermittent drainages, Turnover Creek and an unnamed tributary. Located in various terrace settings near these streams, six sites containing cultural materials in alluvial and colluvial deposits—41CV1473, 41CV1478, 41CV1479, 41CV1480, 41CV1482, and 41CV1487—were formally tested. General data and interpretations for these six sites are summarized in Table 54.

Geomorphic Observations

Near 41CV1478, Nordt (1992:130, 173) described, sampled, and dated a section of the Turnover Creek cutbank (designated locality CB1) along the margin of the T_0 surface. The cutbank exhibited an A/C-Ab1-Bwb1-Ab2-Slump profile consisting of Ford (0–192 cm) over West Range (192–367 cm) alluvium. The contact between the two stratigraphic units was at the base of the Bwb1 soil horizon. The lower boundary of the Ab2 soil horizon was not identified due to slumping at the base of the profile. The water line was at 367 cm. A charcoal sample from the Ford alluvium (actual depth not noted) dated to 190 ± 60 B.P. This sample was rejected due to stratigraphic inconsistency relative to other dates and was considered an intrusive modern tree root that was subsequently burned. A bulk humate sample collected from a hearth at 192–212 cm dated to 1010 ± 70 B.P. Lastly, a hearth found lower in the cutbank (in the lower portion of a slump block between 192 and 367 cm) yielded a radiocarbon assay of 1936 ± 51 B.P.

Subsequent to the original description of 41CV1480, Nordt (1992) conducted a geomorphological investigation of the Leon River terrace on which the site is located as part of a general study of alluvial stratigraphy and chronology on Fort Hood. One excavated backhoe trench (designated Trench Locality 4) was described by Nordt, in addition to a section of the Leon River cutbank (labeled Cutbank Locality 2). From the surface to 145 cm, the trench and cutbank exhibited similar A-Bw-Ab-Bwb soil profiles formed in the Ford alluvium (T_0). In the cutbank

Table 54. Summary of Leon River sites

Site	Location	Subsurface testing	Analysis Unit	Geomorphic setting/depositional unit	Temporal/cultural periods	Integrity of cultural deposits
41CV1473	Leon River	2 BHTs, 4 TUs	1	T_2/colluvial mantle overlying Jackson alluvium	Late Prehistoric–Archaic	poor
41CV1478	Turnover Creek	3 BHTs, 3 TUs	1	T_1/Ford alluvium	none defined	poor
			2	T_1/Leon River paleosol and West Range alluvium	Late Prehistoric (Austin phase)	good
			3	T_1/Leon River paleosol and West Range alluvium	Late Archaic	good
41CV1479	Turnover Creek	3 BHTs, 2 TUs	1	T_1/Ford alluvium	none defined	poor
			2	T_1/Leon River paleosol and West Range alluvium	Late Prehistoric (Austin phase)	good
41CV1480	Leon River	3 BHTs, 2 TUs	1	T_0–T_1 complex/Ford alluvium	Late Prehistoric (Toyah phase)	good
41CV1482	Leon River	4 BHTs, 3 TUs	1	T_1/Ford alluvium	none defined	poor
			2	T_1/Leon River paleosol and West Range alluvium	Late Prehistoric (Austin phase)	good
			3	T_1/Leon River paleosol and West Range alluvium	Late Archaic	good
41CV1487	Leon River	2 BHTs, 4 TUs	1	T_1/Ford alluvium	none defined	poor
			2	T_1/Leon River paleosol and West Range alluvium	none defined	poor

locale, a feature (hearth or midden) was exposed in the Ab horizon at 124 cm below the surface and yielded a radiocarbon assay of 610 ± 50 B.P. (Nordt 1992:131).

The current geomorphic investigations of the six Leon River archeological sites revealed prehistoric occupations encapsulated in a buried alluvial soil of the T_1 terrace at five of the six sites (the sixth site is contained in a Holocene colluvial mantle overlying the T_2 Jackson terrace). This soil, termed the Leon River paleosol, formed on the West Range alluvium and is buried below the T_0 surface in some areas by more than 2 m of Ford alluvium. The Leon River paleosol is typically dark in color and clayey to loamy in texture. A horizons are thick, sometimes cumulic in nature, and typically dark to very dark gray in color. B horizons are weakly developed (Bw) and dark gray to dark grayish brown in color. Some B horizons exhibit accumulations of secondary carbonate (Bk). Not uncommon are intervening AB horizons between the A and B horizons of the Leon River paleosol. A conventional radiocarbon age of 1160 ± 40 B.P. on a bulk humate sample from the Leon River paleosol at 41CV1479 is similar to the radiocarbon age (1010 ± 70 B.P.) reported by Nordt (1992) from the same buried soil at 41CV1478. Artifact assemblages recovered from the Leon River paleosol represent occupations dating to the latter half of the Late Archaic period and the Late Prehistoric. The Leon River paleosol appears to be a distinct horizon marker capping the West Range alluvium throughout the portion of the Leon River valley investigated by Prewitt and Associates and Nordt (1992). There also is evidence that this horizon marker extends beyond the study area and may be found throughout the Leon River drainage basin. Nordt (1995) noted a cumulic soil, termed the Tanktrail paleosol, capping upper West Range deposits and buried by Ford-age sediments in the Henson Creek valley, a tributary of the Leon River. Nordt (1995:208) obtained a conventional radiocarbon age of 1300 ± 80 B.P. on charcoal from the base of the paleosol. He also recognized the archeological potential of the Tanktrail paleosol for containing Late Archaic and Late Prehistoric occupations (Nordt 1995:217). The basinwide occurrence of surface stability which afforded the development of these soils also provided for the utilization of these surfaces by prehistoric groups. Also, the cumulic nature of the Leon River and Tanktrail paleosols has provided for the vertical separation of multiple temporal components encapsulated within the soils.

This is in contrast to the Cowhouse Creek valley, where the deposition of the upper West Range alluvium ceased due to deep channel incision and subsequent deposition of the Ford alluvium commenced on a lower surface. These events left the upper West Range alluvium subaerially exposed with mixed Late Archaic and Late Prehistoric archeological components on the T_1 terrace surface.

The paleoenvironmental implications of the Leon River and Tanktrail paleosols (see Nordt 1995) observed and dated throughout portions of the Leon River basin indicate a period of relative surface stability, which promoted utilization of these floodplains by prehistoric peoples. Henry et al. (1980) reported on a temporally coeval paleosol in the Hog Creek valley to the north of Fort Hood in Bosque County, suggesting that an interbasin occurrence of floodplain stabilization and soil formation at ca. 1300–1000 B.P. may be related to a change in climate.

Channel incision and subsequent floodplain stabilization and soil formation has been argued by Hall (1990) as evidence of a widespread regional climatic shift to more arid conditions across the Southern Plains at ca. 1000 B.P. Alone, a cause and effect relationship of increasingly arid conditions and subsequent channel incision is debatable, given the number of factors that influence stream behavior. However, several lines of evidence, in addition to channel entrenchment and floodplain stabilization, do suggest that at the onset of the second millennium A.D. climatic conditions became increasingly arid across the Southern Plains. Recent investigations throughout the region have provided evidence of lower local water tables, expansion of grasslands (particularly short grasses), and increased eolian activity (Frederick 1998; Holliday 1985; Huebner 1991; Kibler 1998).

Cultural Observations

Although they yielded cultural materials, sites 41CV1473 and 41CV1487 did not contain intact, separable cultural components. Located on a stable Pleistocene terrace (T_2) overlooking the Leon River, 41CV1473 produced mixed and compressed multicomponent cultural deposits within a 20- to 50-cm-thick, unconsolidated

sandy matrix. Downslope and northeast of 41CV1473, 41CV1487 is situated on a lower terrace (T_1) adjacent to the Leon River. The cultural remains encountered at this site were ephemeral and lacked contextual integrity. No meaningful analytical units could be defined at either of these sites.

At the four remaining sites—41CV1478, 41CV1479, 41CV1480, and 41CV1482—discrete depositional units were identified, and isolable cultural zones within them were defined as analysis units. At these sites, culture-bearing deposits designated as Analysis Unit 1 represent the Ford alluvium, while those designated Analysis Units 2 and 3 represent the Leon River paleosol within the West Range alluvium. At these four Leon River sites, nine analysis units were defined as follows:

41CV1478, Analysis Unit 1 (minimal cultural evidence)
41CV1478, Analysis Unit 2
41CV1478, Analysis Unit 3
41CV1479, Analysis Unit 1 (minimal cultural evidence)
41CV1479, Analysis Unit 2
41CV1480, Analysis Unit 1 (two separable occupations)
41CV1482, Analysis Unit 1
41CV1482, Analysis Unit 2
41CV1482, Analysis Unit 3

Of these nine analysis units, only seven produced sufficient artifacts and features to represent discrete occupation zones or periods of occupation. Faunal remains provide evidence that hunting activities were important along the Leon River; the analyzed faunal assemblages from four Leon River sites are described in Appendix C. Animals identified among the remains from 41CV1478 (n = 180), 41CV1479 (n = 303), 41CV1480 (n = 34), and 41CV1482 (n = 148) include toads/frogs, turtles, snakes, birds, all sizes of mammals, rabbits, various rodents, carnivores, and deer. Burning and spiral fractures are evident on a significant portion of the remains from 41CV1478 (8 and 16 percent, respectively), 41CV1479 (13 and 22 percent, respectively), and 41CV1482 (8 and 28 percent, respectively). When compared with the faunal materials from rockshelters, the Leon River assemblages exhibit very little rodent gnawing, pitting, and weathering. Consequently, a much higher percentage of the remains from these sites is likely to represent materials introduced by cultural processes.

Multiple occupation episodes were recognized within a single analysis unit only at one site. Two discrete occupation lenses were identified in the Ford alluvium (Analysis Unit 1) at 41CV1480. A radiocarbon age of 420 ± 70 B.P., obtained on charcoal from a basin hearth (Feature 1), indicates that the upper occupations (ca. 160–180 cm) occurred during the Late Prehistoric Toyah phase. Although this constitutes the only chronometric data, the lower cultural zone (ca. 219–263 cm) includes a mussel shell feature and is temporally assigned to the Late Prehistoric period based on its occurrence in Ford alluvium (Nordt 1992:52–80). In a study of the archeological geology of Fort Hood (Nordt 1992), another feature (hearth or midden) exposed in the cutbank near 41CV1480 yielded a charcoal radiocarbon age of 610 ± 50 B.P. This result does not overlap with the radiocarbon assay from 41CV1480 and suggests that the Ford alluvium in this area may contain cultural occupations spanning a period of some 200–300 years. While the lower occupation zone predates the upper zone at 41CV1480, it is probably not significantly earlier, and Nordt (1992:76–77) notes that Ford alluvial deposits are generally only about 400–800 years old.

The assemblages from the upper and lower occupation zones at 41CV1480 consist primarily of burned rocks and mussel shell valves (Table 55). All of the burned rocks (n = 68) were associated with the upper occupation containing the two hearths; only 20 (29.4 percent) of these were actually contained in the feature sediments. The greater number of burned rocks surrounding the features probably resulted from feature maintenance (i.e., discarded debris) or disturbance of other hearths. The hearths also produced a variety of macro-botanical remains (see Appendix D). Feature 1 yielded remains of maple wood and yucca root, possibly indicating processing of yucca for food. Containing hackberry nutlets, Feature 2 provides evidence of another valuable food source. These botanical remains, along with feature morphology, suggest that both hearths functioned as cooking pits. Wood charcoal of persimmon and the legume and rose families in Feature 2 probably represents use of these hardwoods as fuel; however, their presence also reveals the variety of flora

Table 55. Summary of cultural materials recovered from occupation zones within Leon River sites

Site	Analysis Unit	Occupation zone (feature associations)	Stone tools #	Stone tools %	Debitage #	Debitage %	Burned rocks #	Burned rocks %	Unburned rocks #	Unburned rocks %	Mussel shells #	Mussel shells %	Bones #	Bones %	Totals #	Totals %
LATE PREHISTORIC TOYAH PHASE																
41CV1480	1	Upper occupation zone (Features 1 & 2)	–	0	1	0.7	68	49.4	–	0	59	33.1	30	16.8	158	100
LATE PREHISTORIC, UNDEFINED (probable Toyah phase)																
41CV1478	1	*	–	0	2	10.0	4	20.0	–	0	3	15.0	11	55.0	20	100
41CV1479	1	*	1	1.5	6	9.1	8	12.1	–	0	19	28.8	32	48.5	66	100
41CV1480	1	Lower occupation zone (Feature 3)	–	0	–	0	–	0	–	0	48	92.3	4	7.7	52	100
41CV1482	1	*	–	0	–	0	1	50.0	–	0	1	50.0	–	0	2	100
LATE PREHISTORIC AUSTIN PHASE																
41CV1478	2	Late occupation zone	9	1.2	49	6.5	17	2.2	–	0	577	75.7	110	14.4	762	100
41CV1479	2	Cultural zone and living surface of Feature 1	3	1	22	4.4	36	7.7	43	15.1	114	29.1	242	42.7	460	100
41CV1482	2**	Upper occupation zone (Feature 1)	1	0.2	19	4.4	258	60.6	–	0	109	25.6	39	9.2	426	100
LATE ARCHAIC																
41CV1478	3	Early occupation zone (Feature 1)	1	0.1	9	9.0	57	55.6	–	0	5	5	31	30.3	103	100
41CV1482	3	Middle occupation zone (Features 2 & 3)	1	0.2	93	26.2	121	33.8	–	0	124	34.7	18	5.1	357	100
41CV1482	3	Lower occupation zone (Feature 4)	–	0	18	24	47	63	–	0	4	5	6	8	75	100

* The ephemeral cultural materials in this analysis unit do not constitute a discrete occupational zone.
** This analysis unit may represent an occupation during the transition from Late Archaic to Austin phase.

available for potential consumption. In addition to utilization of different wood types, the hearths exhibited distinctive examples of firing. Feature 1 was comprised of three burned rocks and abundant charcoal underlain by oxidized soil, whereas Feature 2 consisted of ash and charcoal among two layers of burned rocks (n = 17). This suggests an even temperature and possible longer-lasting fire vs. a faster burning fire of higher intensity.

Based on the foregoing, Toyah phase subsistence activities included gathering and processing of bivalves and plant foods. Relatively few or no animal bones are associated with very ephemeral Toyah-age occupations at 41CV1478 and 41CV1482, but the Analysis Unit 1 faunal assemblages from 41CV1479 and 41CV1480 are intriguing. Deer and medium to large mammal bones were common at 41CV1479; the large mammal bones (at least six fragments) are probably bison, although no positive identifications could be made. Faunal remains from 41CV1480 also include medium to large mammal bone fragments and at least one large mammal specimen that could be bison. Turtle shell fragments recovered at the latter site also may be cultural.

Two sites, 41CV1478 and 41CV1479, clearly demonstrate utilization of the area during the early portion of the Late Prehistoric period (Austin phase). These Analysis Unit 2 occupations include a cultural zone (170–220 cm) at 41CV1478 and a living surface associated with Feature 1 (170–210 cm) and a cultural zone (180–220) at 41CV1479. Based on the presence of stratigraphically isolable cultural zones with intact features and concurrent peaks in the frequencies of cultural materials, it appears that discrete occupational evidence is preserved within the Leon River paleosol. Radiocarbon ages ranging between ca. 780 and 940 B.P. were obtained from the Feature 1 living surface and both cultural zones. Temporally diagnostic artifacts recovered include a Scallorn and an untyped arrow point.

Feature 1 at 41CV1479 is composed primarily of unburned rocks, and its function is not known. The two most common artifact types associated with the occupation zones at 41CV1479 are mussel shell valves and animal bones (see Table 55). The ratio of shells to bones is much higher at 41CV1478 (5.3 to 1) than at 41CV1479 (1 to 2.1). The greater number of bivalves at 41CV1478 may relate to the fact that the site's location, on a southward-migrating point bar, was particularly suitable for the gathering and processing of mussels. Three shell fragments from this site exhibit evidence of cutting and/or perforation indicative of manufacture of shell ornaments. Lithic artifacts are present but relatively rare in the 41CV1478 assemblage; stone tools include a perforator, one miscellaneous uniface, and five expedient scrapers. Both of these cultural zones produced diverse macrobotanical remains (see Appendix D), with yucca root, sunflower and juniper seeds, and hickory nut fragments most likely being food resources. Yucca is the only plant found in both Austin and Toyah phase contexts in the Leon River sites. Oak appears to have been the dominant fuel source, with sycamore wood and nonwoody plants of the grass and sedge families also represented.

As in the Toyah phase, plant and aquatic resources were important for subsistence. Hunting appears to have been important as well. Bones representing animals possibly hunted by Austin phase peoples are common at 41CV1478, 41CV1479, and 41CV1482. Among the animal bones found at these sites are remains of all sizes of mammals (small, medium, and large; the latter possibly being bison), with deer, beaver, rabbits, birds, and turtles being specifically identified. Deer is the most commonly identified animal in these assemblages.

In the vicinity of 41CV1478, a bulk humate sample collected from a hearth exposed at 192–212 cm in the cutbank of Turnover Creek yielded a radiocarbon age of 1010 ± 70 B.P. (Nordt 1992: 130, 173). This date overlaps with a radiocarbon age of 1060 ± 60 B.P. obtained from the Analysis Unit 2 occupation at 41CV1482. Both dates fall at the transition from the Late Archaic period into the Austin phase. An occupation zone within Analysis Unit 2 at 41CV1482 includes a flat, rock-lined hearth (Feature 1), with cultural materials predominantly consisting of burned rocks (60.6 percent) and mussel shells valves (25.6 percent). One shell exhibits evidence of cutting. The assemblage also includes vertebrate faunal remains (9.2 percent), debitage (4.4 percent), and stone tools (0.2 percent). No identifiable charred plant remains were present in the hearth matrix, suggesting utilization of the feature for processing of faunal materials. Although not formally excavated, a second hearth was exposed in a backhoe trench profile. Based on

its relative stratigraphic position, it appears to be contemporaneous with Feature 1.

The Late Archaic period is represented by a single occupation zone in Analysis Unit 3 at 41CV1478 and two occupation zones within Analysis Unit 3 at 41CV1482. All three of these occupation zones contained burned rock features defined as a flat rock-lined hearth, two basin-shaped rock-lined hearths, and a burned rock concentration. The burned rock features, along with vertebrate and invertebrate remains, suggest that Late Archaic subsistence was a mix of hunting and gathering. Based on radiocarbon ages of ca. 1830–2140 B.P., these occupations reveal intensive utilization of the area during the latter half of the Late Archaic period. In addition, Nordt's (1992:130, 173) radiocarbon date of 1936 ± 51 B.P. on charcoal from a hearth at 192–367 cm in the cutbank of Turnover Creek near 41CV1478 provides evidence of occupations dating to this time frame (although the profile description is vague, it appears that this hearth was found in the lower slumped portion of a buried soil [Ab2 horizon] and may have originated at a depth of greater than 250 cm).

A broad range of activities is represented by the diverse assemblage of cultural materials from an occupation zone within Analysis Unit 3 at 41CV1478 (see Table 55). Most noticeable is the relative abundance of lithic materials in contrast to the tiny sample of stone tools. Charred macrobotanical remains recovered from a single flotation sample of Feature 1 sediments include fragments of *Yucca* sp. root, *Juniperus* seeds, and unidentified seed fragments, along with oak and sycamore wood (see Appendix D). The faunal assemblage associated with Analysis Unit 3 at 41CV1478 includes many small, medium, and medium to large mammal bones and at least one large mammal bone that could represent bison. Animals specifically identified in this assemblage include deer, turtle, rabbit, and snake.

At 41CV1482, three burned rock features are attributed to the Late Archaic period. Based on the frequency of mussel shell valves within and surrounding Feature 3, this hearth may have functioned as a clam-baking pit. It is unclear whether the absence of plant remains in this feature signifies minimal exploitation of floral resources, indicating a unique function for this feature, or if it represents a sampling bias due to poor preservation. Although they generally appear to be heating/cooking/processing locations, no specific functions can be assigned to Features 2 and 4 at 41CV1482. The diverse assemblage of faunal remains recovered from Analysis Unit 3 at 41CV1482 includes bones of turtles, toads/frogs, birds, rabbits, deer, and large mammal (possibly bison). This assemblage is generally similar to the faunal remains associated with Analysis Unit 3 at 41CV1478.

Discussion

Within the Leon River drainage basin, four sites provide evidence of intensive occupation from the middle of the Late Archaic period through the Late Prehistoric period. Three of these sites (41CV1478, 41CV1479, and 41CV1480) occur within a few hundred meters of each other, while the fourth (41CV1482) is located approximately 1 km east of these clustered sites. All of these sites contain cultural evidence buried in Ford and/or West Range alluvium.

Buried in the Ford alluvium, a dated Toyah phase occupation at 41CV1480 (A.D. 1443–1621, calibrated) reveals intensive exploitation of plant and aquatic resources. Previous investigations at Fort Hood (Abbott and Trierweiler 1995a:424–450, 552–567) have demonstrated the presence of separable Toyah phase occupations at two other open sites. At 41CV174 along Table Rock Creek and at 41CV1038 on a tributary of Cowhouse Creek, basin-shaped hearths yielded charcoal that is radiocarbon dated to ca. 361–540 B.P. These features are similar in morphology to those at 41CV1480. The recovery of a Perdiz point and bison bone associated with the hearth at 41CV1038 is evidence that Toyah buffalo hunters were occasionally present in the Fort Hood area. Although limited, the data confirm that Toyah phase subsistence included hunting and gathering, most likely dependent on seasonal availability of region-specific resources along the Leon River and vicinity.

The Leon River paleosol appears to represent a chronologically and culturally significant local horizon marker atop the West Range alluvium. Deposition of the West Range alluvium started as early as 4300 B.P. in the Leon River valley and ended sometime between 800 and 600 B.P. (Nordt 1992:66), but sedimentation rates may have slowed significantly by 1000 B.P. based on radiocarbon ages on soil humates from the Leon River paleosol. Artifact recovery from this paleosol suggests that sedimentation slowed and

pedogenesis commenced as early as 1500 B.P.

Seven calibrated charcoal radiocarbon dates from the paleosol indicate repeated occupations in this short stretch of the Leon River during two major periods, one beginning perhaps as early as 348 B.C. and lasting until A.D. 315, the other beginning ca. A.D. 898 and lasting perhaps as late as A.D. 1621 (Figure 82). The older dates represent occupations and activities during the latter third of the Late Archaic period (ca. 2050 B.C. to A.D. 750 according to Collins [1995], see Figure 4). Associated features, artifacts, and faunal and botanical samples suggest that these peoples were generalized hunters and gatherers who exploited a wide range of animal (e.g., freshwater mussels, turtles, rabbits, deer, and probably bison) and plant resources. Rather than reflecting limited use of plant foods, the near absence of identifiable plant remains from these Late Archaic contexts appears to be the result of a combination of limited sampling and poor preservation. Late Archaic occupations along the Leon River appear generally similar to Late Archaic occupations elsewhere on Fort Hood. Most of the separable, discrete occupations represented throughout Fort Hood occurred during the Late Archaic (Trierweiler 1996).

The younger dates are evidence of repeated occupations during transitional Archaic times and throughout the Late Prehistoric period. Austin phase occupations are well represented. Food consumption still included aquatic resources (i.e., freshwater mussels), a variety of edible plants (flotation of sediments from an ash anomaly associated with Analysis Unit 2 at 41CV1479 produced many identifiable charred plant parts, including nuts and seeds of hickory, juniper, sunflower, sedge, and grass), and game animals, principally deer.

Additional evidence of hunting and processing of animals is represented by the recovered projectile points and possibly by the expedient scrapers. Two previously investigated open sites (41CV95 and 41CV97) along Cowhouse Creek each contained a hearth which yielded radiocarbon ages attributed to the Austin phase (Abbott and Trierweiler 1995a:349–407). However, the overwhelming body of evidence for Late Prehistoric occupations is from open sites located in the Paluxy sands and in rockshelters (Abbott and Trierweiler 1995a:814–842).

The Toyah phase, which appeared in Central Texas around A.D. 1300, is represented by a single date, although contemporaneous occupations are represented at several of the Leon River sites. Based on these small samples, there are no apparent significant differences in the artifact assemblages, macrobotanical remains, or faunal remains when comparing the Austin phase and Toyah phase components. One possible exception, however, is that large mammal bones, perhaps representing bison, are more common in the later components.

OTHER OPEN SITES

The remaining four open sites are 41BL155B, 41BL816, 41CV722, and 41CV1549. Because 41BL816 is located on a slope in which no intact deposits are present, it is not addressed further. The other three sites—41CV1549 is located along a major stream and 41BL155B and 41CV722 are located along unnamed low-order drainages—yielded varying amounts of cultural materials and contained intact features. A general discussion of each of these sites follows.

Cowhouse Creek Site

Site 41CV1549 was the only site investigated along Cowhouse Creek during the current study. Without a large sample for comparison, only limited inferences regarding sites in this drainage may be made.

Two constructional surfaces, T_0 and T_1, are present at 41CV1549. The broad T_0 surface is comprised of Ford alluvium overlying an upper West Range alluvium with multiple buried soils. The bulk of the T_1 terrace consists of upper and lower West Range alluvial deposits overlying a truncated Royalty paleosol/Georgetown alluvium. Along the terrace margins, the muddy overbank facies of the upper and lower West Range give way to sandy channel fill and channel fill margin facies.

The presence of two small discrete burned rock features and low frequencies of associated cultural materials, as well as the radiocarbon ages obtained from the feature charcoal, indicate that 41CV1549 was occupied repeatedly for relatively short periods of time during the Late Archaic. The faunal evidence indicates that medium to large mammals, including deer (see Appendix C), and freshwater mussels were exploited for subsistence.

Of the recovered chipped stone artifacts, 49

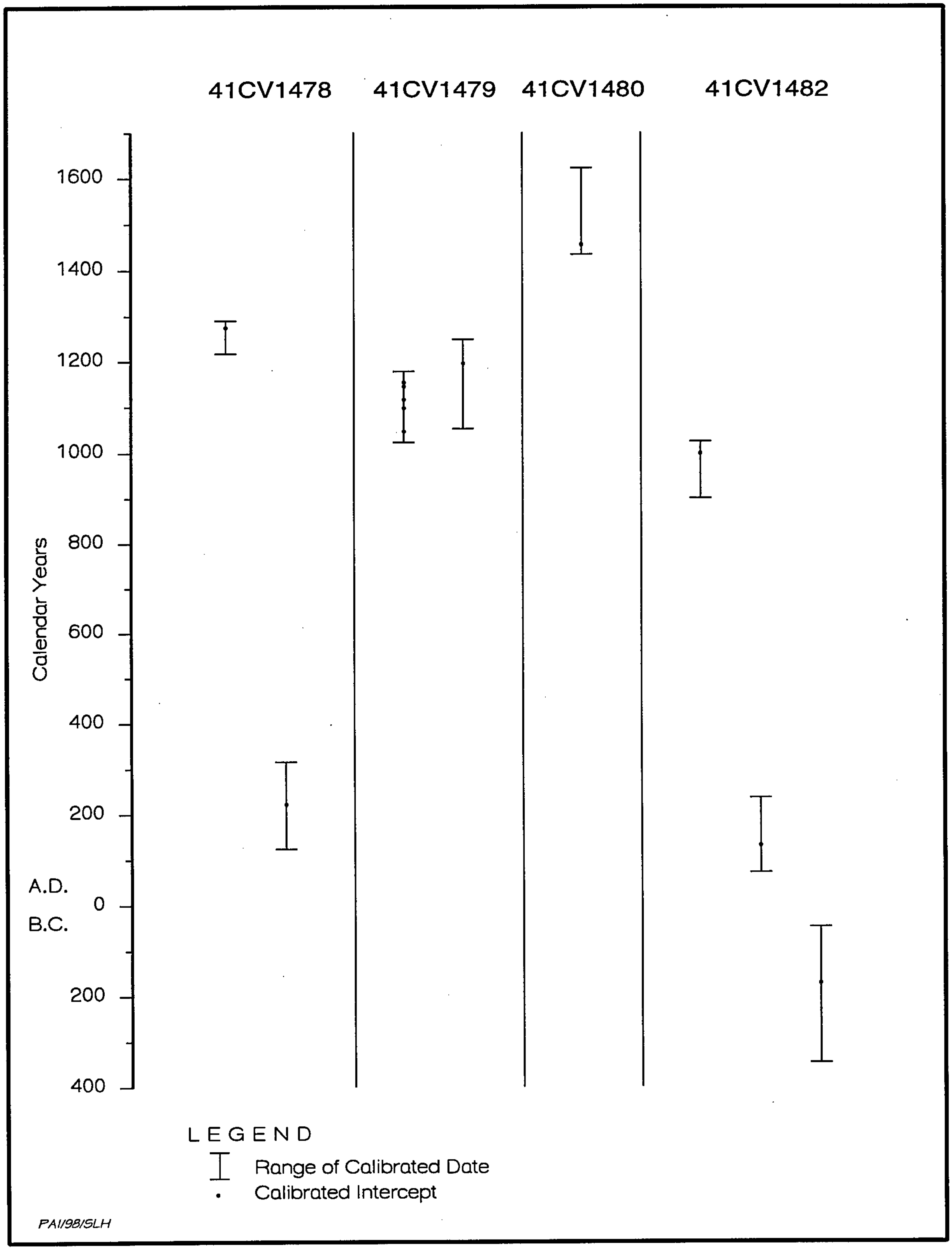

Figure 82 Comparison of calibrated charcoal radiocarbon dates from Leon River sites 41CV1478, 41CV1479, 41CV1480, and 41CV1482.

percent (n = 181) were classified to identifiable chert types and can be compared with previous studies of lithic materials from Cowhouse Creek sites. At 41CV1549, North Fort chert types comprise the majority (n = 115, 64 percent) of identified specimens, with Fort Hood Yellow being the most abundant single type (n = 103). The remainder are Southeast Range types (n = 47, 26 percent), Cowhouse channel types (n = 16, 9 percent), and Table Rock Flat (n = 3, less than 2 percent) from the West Fort chert group. This breakdown is comparable to the findings on the West Cowhouse Group of sites presented by Abbott and Tomka (1995:692–698). The results of the combined investigations suggest that North Fort cherts, especially Fort Hood Yellow, were the preferred materials of the peoples who inhabited the area along Cowhouse Creek on the west side of the military reservation. Perhaps these cherts were preferred because of their superior knappability (or for some other specific reason), or perhaps this area was visited more frequently than other areas and the cherts were simply collected during regular trips to procure resources.

Low-Order Drainage Sites

Sites 41BL155B and 41CV722 are similar in that each (1) is located near the head of a small drainage, (2) has an actively flowing spring, (3) contains a burned rock midden, and (4) encompasses a Late Archaic occupation(s). However, Subarea B of 41BL155 is well defined spatially and appears to have been occupied only during the Late Archaic period, while 41CV722 is an extensive site composed of different geomorphic surfaces and deposits that supported occupations during the Late Archaic and Late Prehistoric periods. Another notable difference is that 41BL155, Subarea B is embedded within a vast and dense lithic resource procurement area, whereas 41CV722 has no known naturally occurring chert resource in the immediate vicinity.

Site 41CV722 is composed of four depositional settings: (1) the distal end of a colluvial deposit on the east side of the valley; (2) gravelly alluvium along the valley axis; (3) toeslopes of interdigitated alluvium and colluvium with multiple buried soils on the west side of the valley; and (4) colluvial deposits on the western midslopes of the valley. Site 41BL155, Subarea B occupies an alluvial terrace most likely composed of a single alluvial unit of middle Holocene age or later. One soil profile (A-Bw-C-Cr profile) has formed on the deposit.

At various locations within 41CV722, four subsurface burned rock features were identified. Three are relatively small and discrete features (i.e., hearth and burned rock concentrations) with low frequencies of associated cultural materials; the fourth is a larger feature (burned rock midden) containing high densities of cultural materials. Site 41BL155, Subarea B also contains a buried burned rock midden, from which large quantities of cultural materials were recovered.

The maximum dimensions of Feature 1 at 41BL155 are estimated to be 90x30 m. Feature 4 at 41CV722 is located within an extensive toeslope which provided few exposures, and the suggested size of 8x4 m is a gross estimation of minimum dimensions. Within the excavation units, these features ranged from 35 to 50 cm in thickness. Only one anomaly, a large slab-lined hearth (Feature 2) at 41BL155, Subarea B, was identified within the burned rock middens. The burned rocks recovered from the midden adjacent to this internal feature, which is interpreted as a baking pit or oven, were noticeably larger than those found throughout the rest of the midden. Of all the features studied during the current investigations, the burned rock middens contained the highest frequencies and widest varieties of cultural materials. Temporal data from the middens at 41BL155, Subarea B and 41CV722 indicate development during the Late Archaic and Late Prehistoric periods, respectively. All of the above-mentioned characteristics are consistent with those of burned rock middens previously investigated on Fort Hood (Kleinbach et. al. 1995:768–801).

The faunal materials recovered from these sites show that deer was probably the primary game animal. The remains of shellfish were sparse at both sites. Macrobotanical remains were recovered by flotation at both sites, but none have been specifically identified.

COMPARATIVE ANALYSIS OF LITHIC ARTIFACT ASSEMBLAGES

Comparisons Between Tool Assemblages

As discussed in Chapter 9, 11 of the sites contain archeological components recommended

as being eligible for listing in the National Register of Historic Places. Only one of these, Shelter B at 41BL69, yielded no chipped lithic artifacts during testing. Based on geomorphic context, absolute dates, and temporal diagnostics, 18 analytical units or components were identified at the other 10 sites. These analytical units consist of 3 Late Prehistoric Toyah phase components, 5 Late Prehistoric Austin phase components, 6 Late Archaic components, and 1 early Paleoindian component. The remaining 3 analysis units are of late Holocene age but cannot be assigned to specific temporal/cultural periods (Table 56). The remainder of this chapter focuses on a comparative analysis of the lithic artifact assemblages from these 18 analysis units. The 10,370 chipped and ground/battered stone artifacts in the 18 analysis units are summarized in Table 57.

The largest samples are from the six Late Archaic components, followed by moderate samples from the five Late Prehistoric Austin phase components. The Late Prehistoric Toyah phase components yielded a relatively small number of chipped and ground/battered stone artifacts, while the early Paleoindian sample consists of only two specimens. Only nine artifacts could not be assigned to any cultural period. Unmodified debitage constitutes 95.3 percent (n = 7,172), 96.8 percent (n = 2,353), and 96.0 percent (n = 386) of the three largest samples. Chipped and ground/battered stone tools are most frequent in the Late Archaic sample (n = 353), followed by the Late Prehistoric Austin phase (n = 79) and Toyah phase (n = 16) samples. A minimum of 100 tools is commonly considered necessary to allow a representative characterization of an archeological assemblage. The Toyah and Austin phase samples from individual components do not satisfy this criteria; even the combined samples do not make up 100 tools. Only the Late Archaic component at 41BL155 has a tool sample of 308 specimens. All other individual site component samples fall significantly below the 100-specimen minimum sample size. Furthermore, Cowgill (1986:383–384) suggests that a more appropriate minimum sample size is 300. He convincingly argues that categories of artifacts that were used infrequently may not be recovered archeologically in percentages reflecting how often they were actually employed. In addition, categories that were parts

Table 56. Summary of analysis units by temporal/cultural period

Site, Analysis Unit	Late Prehistoric, Toyah Phase	Late Prehistoric, Austin Phase	Late Archaic	Early Paleoindian	None*
41BL155, North Terrace	–	–	X	–	–
41BL581, Shelter B	–	–	–	X	–
41BL582, Shelter A	–	–	X	–	–
41BL827	–	X	–	–	–
41CV722, Analysis Unit 1	X	–	–	–	–
41CV722, Analysis Unit 2	–	–	X	–	–
41CV722, Analysis Unit 3	X	–	–	–	–
41CV1478, Analysis Unit 1	–	–	–	–	X
41CV1478, Analysis Unit 2	–	X	–	–	–
41CV1478, Analysis Unit 3	–	–	X	–	–
41CV1479, Analysis Unit 1	–	–	–	–	X
41CV1479, Analysis Unit 2	–	X	–	–	–
41CV1480, Analysis Unit 1	X	–	–	–	–
41CV1482, Analysis Unit 1	–	–	–	–	X
41CV1482, Analysis Unit 2	–	X	–	–	–
41CV1482, Analysis Unit 3	–	–	X	–	–
41CV1549, Analysis Unit 1	–	X	–	–	–
41CV1549, Analysis Unit 2	–	–	X	–	–
Totals	3	5	6	1	3

* These units were not assigned to specific chronological/cultural periods but are late Holocene in age.

Table 57. Summary of lithic artifacts recovered from analysis units by temporal/cultural period

Type of Artifact	Late Prehistoric, Toyah Phase	Late Prehistoric, Austin Phase	Late Archaic	Early Paleoindian	None	Totals
Projectile points	0	19	36	0	0	55
Perforators	0	2	5	0	0	7
Adzes	0	1	13	0	0	14
Knives	1	3	41	0	0	45
Scrapers	7	19	102	1	0	129
Choppers	1	1	9	0	0	11
Gravers	1	0	5	0	0	6
Multifunctional tools	0	0	3	0	0	3
Miscellaneous bifaces	4	8	42	0	1	55
Miscellaneous unifaces	1	16	81	0	0	98
Cores	1	5	10	0	0	16
Unmodified debitage	386	2,353	7,172	1	8	9,920
Ground stones	0	2	6	0	0	8
Hammerstones	0	3	0	0	0	3
Totals	402	2,432	7,525	2	9	10,370

of assemblages in low proportions might never be represented in a random sample of 100 specimens. The latter point also is emphasized by Kintigh (1989) and others with regard to the relationship between assemblage richness, defined in terms of the number of artifact categories represented and sample size. In the combined Fort Hood artifact samples shown in Table 57, richness is highest for the large Late Archaic sample (13 categories, n = 7,525) but decreases as sample sizes decrease in the Austin and Toyah phase samples (12 categories, n = 2,432; 8 categories, n = 402). It is likely that some of these differences in richness are due to sample size rather than cultural differences in land use or site function. A limited attempt is made here to interpret the available artifact samples, but these interpretations are tentative due to limitations imposed by the samples.

Table 58 compares the nondebitage artifacts for the cultural periods. The tabulated data compare the combined frequencies of artifacts and the adjusted standardized residuals. The artifact counts were used to calculate adjusted standardized residuals and do not include the unmodified debitage because the large numbers would significantly skew the results. The adjusted standardized residuals allow examination of the deviations between observed and expected frequencies within individual cells given the various sizes of the samples and the proportional breakdown of artifact categories within them (Everitt 1977). This analysis helps identify specific artifact categories that are under- or overrepresented relative to expected frequencies within and between assemblages. Adjusted standardized residuals that are greater than +1.96 or less than –1.96 are statistically significant (over- and underrepresented, respectively) at the 0.05 level of significance.

The combined Late Archaic sample is characterized by an underrepresentation of projectile points and hammerstones, while knives are overrepresented. The data also show a tendency (although not statistically significant) for the overrepresentation of adzes and miscellaneous unifaces and underrepresentation of cores. Given that the Late Archaic sample is dominated by the large assemblage from 41BL155, it is likely that the patterns seen are more characteristic of this particular site rather than Late Archaic sites in general. The richness of the Late Archaic sample suggests that a broad range of activities was performed. The overrepresentation of knives, adzes, and miscellaneous unifaces implies an emphasis on processing activities other than those associated with seeds or other plant remains. The underrepresentation of cores and hammerstones might suggest a relative lack of emphasis on stone tool manufacturing at Late Archaic sites, but the large quantity of debitage from 41BL155 clearly shows that tool manufacture was commonly performed there even though no hammerstones were recovered. The

Table 58. Comparison of nondebitage artifact categories and adjusted standardized residuals by temporal/cultural period

	Late Prehistoric, Toyah Phase		Late Prehistoric, Austin Phase		Late Archaic		
Artifacts	No. of artifacts	Adjusted standardized residuals	No. of artifacts	Adjusted standardized residuals	No. of artifacts	Adjusted standardized residuals	Totals
Projectile points	0	−1.52	19	**3.51**	36	**−2.58**	55
Perforators	0	−0.51	2	0.77	5	−0.48	7
Adzes	0	−0.73	1	−1.05	13	1.31	14
Knives	1	−0.51	3	**−2.04**	41	**2.13**	45
Scrapers	7	1.37	19	−0.98	102	0.29	128
Choppers	1	1.00	1	−0.75	9	0.25	11
Gravers	1	1.74	0	−1.14	5	0.27	6
Multifunctional tools	0	−0.33	0	−0.80	3	0.90	3
Miscellaneous bifaces	4	1.62	8	−0.58	42	−0.19	54
Miscellaneous unifaces	1	−1.54	16	−0.38	81	1.06	98
Cores	1	0.59	5	1.46	10	−1.62	16
Ground stones	0	−0.55	2	0.55	6	−0.26	8
Hammerstones	0	−0.33	3	**3.76**	0	**−3.35**	3
Totals	16		79		353		448

paucity of cores in the Late Archaic collections (and specifically at 41BL155) might simply indicate that the materials from which tools were manufactured at these sites were not cores in the traditional sense (e.g., uni- or multidirectional cores). Other core types, such as macroflakes or partially reduced bifaces, may have been utilized. This possibility highlights the important systemic connection between sites such as 41BL155, Subarea B and nearby lithic procurement localities (such as 41BL155, Subarea A), where much early reduction might have taken place. Even though projectile points are underrepresented in Late Archaic components, the large number of points implies that hunting was part of the repertoire of Late Archaic activities.

The combined Late Prehistoric Austin phase sample, 70 percent of which is from the single component at rockshelter 41BL827, is characterized by overrepresentation of projectile points and hammerstones and underrepresentation of knives. In addition, cores tend to be overrepresented while gravers and adzes tend to be underrepresented, although none of these trends is statistically significant. The overrepresentation of hammerstones, especially in light of the tendency for cores also to be overrepresented, suggests that Austin phase tool manufacturing, at least at 41BL827, might have been organized somewhat differently than Late Archaic tool manufacturing. That is, there seems to have been less differentiation between the locations where early vs. middle and late stage manufacturing occurred during the Austin phase. Finally, the underrepresentation of knives and the tendency for adzes, gravers, and scrapers to be underrepresented implies less variability in activity at Austin phase sites compared to components from other time periods.

The Toyah phase sample is very small and has no artifact categories that differ significantly from expected frequencies when compared to the other two samples. Although not statistically significant, the sample exhibits tendencies for the overrepresentation of scrapers, choppers, gravers, and miscellaneous bifaces and the underrepresentation of projectile points and miscellaneous unifaces. All of the artifacts in the Toyah phase sample come from Analysis Units 1 and 3 at open campsite 41CV722. As a result, the patterns noted should be seen as characterizing activities at this site rather than the full range of activities within the Toyah phase. Although sample richness is lowest in the Toyah phase, the tendency for four artifact types to be overrepresented suggests an unusually broad range of activities performed at this site. The underrepresentation of projectile points and miscellaneous unifaces may or may not be significant.

Some material culture differences within the

sample may be related to differences in site location/setting. Exactly how differences in physical setting might affect site function and assemblage composition has not yet been proposed. Nonetheless, to investigate the relationship between site setting and lithic artifact samples, components dating to the same time period but in different settings are compared to each other. The Toyah phase is represented at only one site (41CV722), so this sample allows no comparisons. Austin phase materials have been recovered from three components at Leon River sites (41CV1478, Analysis Unit 2; 41CV1479, Analysis Unit 2; and 41CV1482, Analysis Unit 2) and a single rockshelter (41BL827). A comparison of adjusted standardized residuals for these samples indicates that there are no statistically significant differences between the Leon River and rockshelter tool assemblages (Table 59). Nonetheless, the rockshelter sample tends to have smaller than expected numbers of scrapers and choppers and higher than expected numbers of miscellaneous unifaces and hammerstones. Rockshelter sample richness is greater than that of the Leon River components; however, this pattern is difficult to interpret since the rockshelter sample is more than twice as large. The relatively large number of projectile points from 41BL827 indicates that hunting occurred there, although not necessarily with proportionately greater frequency than at the open-air Leon River sites. In the context of sample richness, the underrepresentation of scrapers and overrepresentation of miscellaneous unifaces at the rockshelter suggests that scraping activities may have been performed with less-formalized tools. This tendency might be indicative of a lesser frequency of scraping activities compared to the open air sites. Such differences might hint at significant organizational differences between rockshelters and open-air sites that are perhaps related to site function. This idea is testable if larger artifact assemblages from larger numbers of sites in both settings could be obtained.

Late Archaic components have been identified at two Leon River sites (41CV1478, Analysis Unit 3; and 41CV1482, Analysis Unit 3), one rockshelter (41BL582, Shelter A) and three open campsites located in other settings (41BL155, North Terrace; 41CV722, Analysis Unit 1; and 41CV1549, Analysis Unit 2). The samples of tools from the Leon River and rockshelter components are extremely small, making any generalizations highly tenuous (Table 60). The sample of artifacts from open campsites away from the Leon River differs from the samples from the other two settings only in the underrepresentation of ground stone tools. There also is a tendency in the open campsite sample for projectile points and perforators to be underrepresented. Since a large proportion (87.5 percent) of the projectile points are from 41BL155, North Terrace, it appears that hunting may have been a common activity at this site but was less important at the other two Late Archaic open campsites

Table 59. Comparison of artifact assemblages for the Leon River and rockshelter components of the Austin phase

	Leon River Sites		Rockshelter		
Artifacts	No. of Artifacts	Adjusted Standardized Residuals	No. of Artifacts	Adjusted Standardized Residuals	Totals
Projectile points	5	–0.35	14	0.35	19
Perforators	1	0.64	1	–0.64	2
Adzes	0	–0.65	1	0.65	1
Knives	0	–0.93	2	0.93	2
Scrapers	8	1.39	11	–1.39	19
Choppers	1	1.56	0	–1.56	1
Miscellaneous bifaces	3	0.52	5	–0.52	8
Miscellaneous unifaces	3	–1.06	13	1.06	16
Cores	2	0.53	3	–0.53	5
Ground stones	0	–0.93	2	0.93	2
Hammerstones	0	–1.14	3	1.14	3
Totals	23		55		78

Table 60. Comparison of Leon River, rockshelter, and other open campsite components of the Late Archaic period

	Leon River Sites		Rockshelter		Other Open Sites		
Type of Artifact	No. of artifacts	Adjusted standardized residuals	No. of artifacts	Adjusted standardized residuals	No. of artifacts	Adjusted standardized residuals	Totals
Projectile Points	1	–0.12	3	**2.58**	32	–1.61	36
Perforators	1	**2.19**	0	–0.34	4	–1.46	5
Adzes	0	–0.66	0	–0.56	13	0.88	13
Knives	1	–0.27	0	–1.04	40	0.89	41
Scrapers	4	0.56	1	–1.03	97	0.26	102
Choppers	0	–0.55	1	1.81	8	–0.77	9
Gravers	0	–0.40	0	–0.34	5	0.54	5
Multifunctional tools	0	–0.31	0	–0.26	3	0.41	3
Miscellaneous bifaces	1	–0.29	0	–1.05	41	0.92	42
Miscellaneous unifaces	3	0.35	1	–0.71	77	0.20	81
Cores	0	–0.58	0	–0.49	10	0.77	10
Ground stones	0	–0.44	2	**5.16**	4	**–3.06**	6
Totals	11		8		334		353

(41CV722 and 41CV1549).

Compared to the Leon River and other open campsites, the Late Archaic rockshelter component (41BL582) is characterized by an overrepresentation of projectile points and ground stone tools. The small rockshelter sample also shows a tendency for knives, scrapers, and miscellaneous bifaces to be underrepresented and choppers to be overrepresented. These trends might hint at a relatively narrower range of activities performed at this rockshelter, although the small sample of artifacts raises serious doubts about this speculation.

The only statistically significant difference between Late Archaic components on the Leon River and those from other settings is the overrepresentation of perforators in the former. With this exception, the Leon River sample looks very similar to the other two samples. Again, however, little can be suggested with any confidence based on a sample of 11 artifacts derived from only two Leon River sites.

Raw Material Acquisition, Reduction Sequences, and Reduction Strategies

The reduction strategies employed by prehistoric peoples in tool production were most likely conditioned by the finished tool forms that were the goals of manufacture. That is, if unifacial tools (e.g., scrapers, knives, and gouges) were intended as the final products, then the reduction of naturally occurring raw materials was likely to be oriented toward the production of flake blanks which could be unifacially shaped into finished forms. Bifacial tool manufacture tends to be less limited in the form of the parent material and/or blanks employed in the reduction process (e.g. nodules, flake blanks, and bifacial preforms). Bipolar reduction tends to be limited to the less-controlled reduction of small materials, the minimally retouched or expedient (totally unretouched) manufacture of tools, and/or rather specialized instances (e.g., cobble splitting). Among other things, the portion of the reduction sequence carried out at campsites or residential sites depended upon what stage of reduction the raw material was in when it arrived there and the size and form of the finished tools made on-site. The final destination of the tool (e.g., location of use and/or trade) also may have significantly impacted the degree of tool reduction and the place where the activities took place within the land-use system.

In recent years, a number of archeologists (e.g., Andrefsky 1994; Bamforth 1990; Newman 1994) have demonstrated that raw material acquisition or procurement practices were strongly conditioned by factors such as raw material quality, abundance, location (i.e., distance from campsites), and the performance requirements of the tools to be manufactured. That is, the factors that most strongly conditioned

material acquisition might be related to the quality of the materials available and the spatial relationships between sites where the materials were needed/consumed and the locations where the materials were procured. If these broad relationships apply regardless of region (so far this has proven to be the case in southern California [Bamforth 1990], New Mexico [Newman 1994], northeastern and southeastern Washington and southeastern Colorado [Andrefsky 1994], and northwest Georgia [Jefferies 1982]), one might conclude that the variability in lithic assemblages noted at lithic procurement sites could be due to the distance from which populations came to the site to exploit the resource rather than the time period of exploitation. This is exactly the conclusion reached by Bamforth (1990:93) regarding lithic procurement sites in southern California: ". . . there is no evidence indicating any change over time in the nature of the raw nodules selected, the reduction strategies applied to those nodules, or the general range of material removed from . . . sites." Of course, more variability in debitage attributes is expected at the campsites, where additional staged reduction and manufacture of different types of tools occurred.

To explore whether there was any change through time in the raw materials used at any particular campsite at Fort Hood, the range of chert types found in the Late Prehistoric and Late Archaic debitage samples from four sites is compared. The site with the largest samples of debitage by component is 41CV722. The Late Prehistoric Toyah phase sample consists of 384 unmodified debitage specimens, while the Late Archaic sample contains 187 specimens. Twenty-six chert types are represented in the two components, and all but 6 (23.1 percent) of these occur in both components. The fact that 76.9 percent of the chert types are found in both the Toyah phase and Late Archaic samples suggests that raw materials were procured from the same sources over time. Five of the six chert types not shared by the two components are found only in the larger Toyah phase sample, indicating the likelihood that their absence in the Late Archaic may be due to inadequate sampling.

A similar sample size bias is noted when examining the remaining three sites with both Austin phase and Late Archaic components. Site 41CV1549 has an Austin phase debitage sample of 70 specimens and a Late Archaic sample of 287 specimens. Of the 23 total chert types, only 12 (52.2 percent) are shared by both components. Ten (90.9 percent) of the 11 types not shared are absent from the smaller Austin phase sample. Similar trends are noted in the Austin phase and Late Archaic samples from 41CV1478 and 41CV1482; as samples sizes decrease, the number of shared chert types also decreases.

These data suggest that there was considerable consistency in the chert types exploited from the same sites at different time periods. This evidence most likely reflects consistency in lithic procurement behavior due to the fact that the spatial relationships between campsites and raw material procurement locations remained unchanged through time.

Even if the same procurement localities and chert types were used through time from a given campsite, it does not necessarily mean that materials left the procurement sites and arrived at the campsite in the same form. Testing this possibility using the debitage samples from the nine sites with isolable components is difficult because of small sample sizes, but the Toyah phase and Late Archaic debitage samples from 41CV722 can be compared. The debitage samples were divided into North Fort (FHY, GBG, TN, FHG, ERF, OCB) and Southeast Range (HLB, HLBLT, HLT, HLTB, SMN, ER-flecked, FPB, CW) chert provinces as defined by Abbott and Tomka (1995). Indeterminate chert types and Cowhouse Creek/Table Rock Creek bedload types were not included because places of origin of the first group are not known and the second group constitutes such a small sample that no statistically valid comparisons could be made. Table 61 compares the frequencies and sample sizes of small flakes (<3/8 inch) vs. large flakes (≥3/4 inch) in the North Fort and Southeast Range province chert debitage samples by time period. It also shows the percentages of tertiary debitage within these size groups. Comparing these debitage characteristics can provide a good indication of the sizes of raw materials reduced and the stages of reduction represented (e.g., Hines and Tomka 1994). One must use caution in interpreting these data since debitage from any site consists of naturally occurring materials brought to and reduced at the site, stage-manufactured artifacts brought to and reduced at the site, and finished artifacts brought to and resharpened/reworked at the site. Therefore, the debitage sample reflects the broad range of lithic manufacture activities

Table 61. Comparison of North Fort and Southeast Range province cherts in the Toyah phase and Late Archaic debitage samples from 41CV722*

	Toyah Phase			Late Archaic		
Debitage size class	Number of specimens	Percent	Percent tertiary	Number of specimens	Percent	Percent tertiary
North Fort Province Cherts						
small (<3/8 inch)	39	40.2	92.3	42	53.9	100.0
large (≥¾ inch)	11	11.3	36.4	11	14.1	45.5
Southeast Range Province Cherts						
small (<3/8 inch)	18	35.3	100.0	12	37.5	100.0
large (≥¾ inch)	10	19.6	100.0	3	9.4	100.0

*Debitage sample sizes are: Toyah phase North Fort cherts, n = 97; late Archaic North Fort cherts, n = 78; Toyah phase Southeast Range cherts, n = 51; late Archaic Southeast Range cherts, n = 32.

rather than being a narrow picture of raw material procurement from any one procurement locality.

The comparative data indicate that North Fort province cherts are represented by a relatively large proportion of small flakes, nearly all of which are decorticate, and a small percentage of large flakes, less than half of which are entirely decorticate. Comparison of the Toyah phase and Late Archaic samples of North Fort province cherts based on adjusted standardized residuals shows no statistically significant differences between these samples.

About one-third of the Southeast Range cherts for both the Toyah phase and Late Archaic samples are small flakes, all of which are tertiary specimens. Large flakes represent about 20 percent of the Toyah phase sample but only about 10 percent of the Late Archaic sample; all of the specimens in both of these small samples are entirely decorticate. Again, no statistically valid differences in adjusted standardized residuals are noted between the samples from the two time periods, although there is a tendency for small flakes to be overrepresented (+1.07) in the Late Archaic sample and large flakes to be overrepresented (+1.07) in the Toyah phase sample.

These comparisons show that, although some differences in lithic reduction activities are represented, there are no statistically supportable differences in how North Fort and Southeast Range cherts were treated in the Toyah phase as compared to the Late Archaic period. In addition, there are no statistically valid differences in the reduction sequences evident in these chert groups through time. The patterns suggested by this comparison need to be tested using larger debitage samples from many sites of all time periods across the military reservation to more fully address such research problems.

One of the major difficulties in discussing the movement of cherts across Fort Hood is that the spatial distribution of bedrock and lag outcrops has not yet been systematically documented in all parts of the post. The chert types defined and described Chapter 4 are known from only a handful of localities, although some chert types are known to be more broadly distributed than others. The nature of the chert outcrops (e.g., types, distributions, characteristics, etc.) found in Edwards Group formations located within the Live Fire Area also is not known. In addition, the types and quantities of chert found in the bedloads of a number of large creeks (i.e., Henson Creek and Owl Creek) have not been identified. These limitations, which have been emphasized in previous Fort Hood studies as well (Abbott and Treirweiler 1995a:680; Treirweiler, ed. 1994:278–279), severely hinder analyses and conclusions regarding chert movement and lithic procurement practices, and more importantly, the reconstruction of land-use systems within the project area.

Preliminary but well-grounded impressions formed by Charles Frederick (personal communication 1996) during several years of work in the project area indicate that some north-south and east-west (or northwest to southeast) patterning does exist in the spatial distribution of particular chert types. Comparing the presently known distribution of chert outcrops with the occurrence of Edwards Group formations

indicates some interesting possibilities for future research. The southeast portion of the North Fort chert province, located on the north side of Cowhouse Creek (see Frederick and Ringstaff 1994:154–156), consists of undifferentiated Fort Worth Limestone, Duck Creek Limestone, and Edwards Limestone formations (Barnes 1979). The Southeast Range chert province also consists of these three limestone formations, as does the Seven Mile Mountain region of the West Fort chert province. All three of these formations are chert bearing and probably contribute knappable materials to the lithic landscape in these chert provinces. Most of the central and northwestern portions of the North Fort chert province consist of Kiamichi Clay and Edwards Limestone undivided. Only the Edwards Limestone contributes chert in this portion of the base. Nonetheless, there are small outcrops of chert-bearing limestones other than those of the Edwards Formation within both the North Fort and the north end of the West Fort chert provinces. These outcrops of undivided Denton Clay, Fort Worth Limestone, and Duck Creek Limestone literally form islands within the larger sea of Edwards Formation limestones in this area. Good examples of these settings are found on Manning Mountain, Shell Mountain, Twin Mountain, and Henson Mountain, as well as a series of smaller outcrops in the northwest portion of the post.

To investigate how the distribution of chert bearing formations of the Edwards Group might influence the distribution of chert types across the installation, all debitage from 18 of the 19 tested sites was regrouped according to geographical proximity to the major chert provinces defined by Frederick and Ringstaff (1994:154–156). Given that site 41CV1348 was isolated and its debitage sample consisted of a single flake, it was excluded from this analysis. Six site groupings, with from one to six sites per group, were created for this analysis (Table 62). When possible, these site groups correspond to site groupings defined by Abbott and Tomka (1995:679–709) based on a sample of 57 sites. Tables 63 through 68 show the site-by-site occurrence of chert types by chert province and regional site grouping. Figures 83 through 88 graphically illustrate the presumed chert province origin of the debitage within each site grouping.

It is clear that in the extreme northern portion of the installation, North Fort province cherts dominate the samples in the Leon River site group (see Figure 83). In the North Fort South site group (see Figure 84), located in the southeastern portion of the North Fort chert province just north of Cowhouse Creek, and the Cowhouse East site group (see Figure 85), North Fort province cherts are most common, although just over one-quarter of each sample is comprised of Southeast Range province specimens. Not surprisingly, Southeast Range chert types are most common in the Southeast Range site group, which is located entirely within the Southeast Range chert

Table 62. Regional site groupings and lithic debitage sample sizes (excludes 41CV1348).

Regional grouping	Sites in group		Debitage sample size*
Leon River	41CV1473	41CV1480	2,547
	41CV1478	41CV1482	
	41CV1479	41CV1487	
North Fort South	41BL69	41BL667	4,469
	41BL181		
Cowhouse East	41BL579	41BL582	782
	41BL581	41CV722	
Southeast Range	41BL155	41BL827	8,485
	41BL816		
West Fort North	41CV944		1,013
Cowhouse West	41CV1549		357
Total			17,653

*Samples include all debitage recovered except for a single flake from 41CV1348, 33 specimens deleted from the database due to coding errors, and 25 Leona Park chert specimens known to be from an off-base locality. Excluded Leona Park specimens are 1 flake from 41CV1482 and 24 flakes from 41BL181.

Table 63. Leon River site group debitage by chert province and type

Province	Chert Type	41CV1473	41CV1478	41CV1479	41CV1480	41CV1482	41CV1487	Type Totals	Percent of Identified	Percent of Total
Southeast Range	2 CW	1	0	0	0	0	0	1	0.05	0.04
	6 HLT	0	1	0	0	0	0	1	0.05	0.04
	7 FPB	0	1	0	0	0	0	1	0.05	0.04
	9 HLTB	1	0	0	0	0	0	1	0.05	0.04
	13 ER-flecked	4	0	0	0	0	0	4	0.20	0.16
	Subtotals	6	2	0	0	0	0	8	0.40	0.31
North Fort	8 FHY	1,603	55	14	2	153	7	1,834	92.77	72.01
	14 FHG	13	0	1	0	8	0	22	1.11	0.86
	15 GBG	54	2	1	0	17	0	74	3.74	2.91
	17 OCB	17	1	0	0	19	0	37	1.87	1.45
	Subtotals	1,687	58	16	2	197	7	1,967	99.49	77.23
Cowhouse	19 CDG	0	0	0	0	1	0	1	0.05	0.04
	22 CMF	1	0	0	0	0	0	1	0.05	0.04
	Subtotals	1	0	0	0	1	0	2	0.10	0.08
Identified Subtotal		1,694	60	16	2	198	7	1,977		77.62
Indeterminate	29 white	41	0	3	0	2	0	46		1.81
	30 yellow	2	9	1	0	4	0	16		0.63
	31 mottled	2	0	0	0	1	0	3		0.12
	32 light gray	49	2	1	0	9	1	62		2.43
	33 dark gray	42	0	0	0	8	0	50		1.96
	34 light brown	247	3	6	0	42	0	298		11.70
	35 dark brown	67	1	1	0	12	1	82		3.22
	36 black	4	0	0	0	0	0	4		0.16
	38 red	1	4	3	0	1	0	9		0.35
	Subtotals	455	19	15	0	79	2	570		22.38
Totals		2,149	79	31	2	277	9	2,547		

Table 64. North Fort South site group debitage by chert province and type

Province	Chert Type	41BL69	41BL181	41BL667	Type Total	Percent of Identified	Percent of Total
Southeast Range	1, 10 HLB-LT	2	0	14	16	0.77	0.36
	2 CW	31	0	29	60	2.89	1.34
	6 HLT	8	2	50	60	2.89	1.34
	9 HLTB	1	0	5	6	0.29	0.13
	13 ER-flecked	136	92	2	230	11.07	5.15
	Subtotals	178	94	100	372	17.91	8.32
West Fort	3 AMG	3	0	1	4	0.19	0.09
North Fort	8 FHY	99	821	167	1,087	52.34	24.32
	11 ERF	0	70	1	71	3.42	1.59
	14 FHG	2	2	0	4	0.19	0.09
	15 GBG	59	169	20	248	11.94	5.55
	17 OCB	23	244	9	276	13.29	6.18
	Subtotals	183	1,306	197	1,686	81.17	37.73
Cowhouse	19 CDG	3	12	0	15	0.72	0.34
Identified Subtotals		367	1,412	298	2,077	100.00	46.48
Indeterminate	29 white	44	173	98	315		7.05
	30 yellow	3	3	1	7		0.16
	31 mottled	2	3	1	6		0.13
	32 light gray	56	436	90	582		13.02
	33 dark gray	39	402	47	488		10.92
	34 light brown	81	314	133	528		11.81
	35 dark brown	62	212	32	306		6.85
	36 black	14	72	20	106		2.37
	38 red	11	30	13	54		1.21
	Subtotals	312	1,645	435	2,392		53.52
Totals		679	3,057	733	4,469		

province on the south side of the Cowhouse Creek drainage (see Figure 86). As one moves to the West Fort North and Cowhouse West site groups (see Figure 87 and 88), North Fort Province cherts are the most common types. Southeast Range chert types are more common at 41CV1549, located at the extreme west end of the installation on Cowhouse Creek (see Figure 88) than at 41CV944 located on the southern end of Manning Mountain.

When the chert type distributions for the 57 sites studied by Abbott and Tomka (1995:Figures 8.3 though 8.10) and for the 18 sites reported here are compared with the distributions of limestone-bearing Edwards Group formations described above, it is clear that some chert types occurring in the undifferentiated Fort Worth Limestone, Duck Creek Limestone, and Edwards Limestone formations do not occur in areas where only the Edwards Limestone Formation is present. For instance, Southeast Range province chert types are most common at sites in the Southeast Range (see Figure 86 and Abbott and Tomka 1995:Figures 8.3–8.5), which consists of an undifferentiated combination of the three limestone formations. Similarly, moderate percentages of Southeast Range province chert types were noted at sites along the western portion of Cowhouse Creek (see Figure 88 and Abbott and Tomka 1995:Figures 8.7–8.10). At first glance, these materials found so far from the Southeast Range province might be interpreted as evidence of long-distance transport of materials from around Heiner Lake. However, a more likely interpretation is that some Southeast Range cherts may also be present in undifferentiated Fort Worth, Duck Creek, and Edwards Limestone formations found on

Table 65. Cowhouse East site group debitage by chert province and type

Province	Chert Type	41BL579	41BL581	41BL582	41BL722	Type Total	Percent of Identified	Percent of Total
Southeast Range	01, 10 HLB-LT	0	0	1	20	21	6.10	2.69
	02 CW	0	0	0	13	13	3.78	1.66
	06 HLT	3	0	1	29	33	9.59	4.22
	07 FPB	0	0	4	1	5	1.45	0.64
	09 HLTB	0	0	6	19	25	7.27	3.20
	13 ER-flecked	0	0	0	1	1	0.29	0.13
	Subtotals	3	0	12	83	98	28.49	12.53
North Fort	05 TN	0	0	0	1	1	0.29	0.13
	08 FHY	8	0	25	102	135	39.24	17.26
	11 ERF	0	0	0	6	6	1.74	0.77
	14 FHG	1	0	0	5	6	1.74	0.77
	15 GBG	0	0	6	41	47	13.66	6.01
	17 OCB	0	0	8	20	28	8.14	3.58
	Subtotals	9	0	39	175	223	64.83	28.52
Cowhouse	18 CTT	0	0	0	4	4	1.16	0.51
	19 CDG	0	0	0	17	17	4.94	2.17
	20 CSH	0	0	1	0	1	0.29	0.13
	28 TRF	0	0	0	1	1	0.29	0.13
	Subtotals	0	0	1	22	23	6.69	2.94
Identified Subtotal		12	0	52	280	344		43.99
Indeterminate	29 white	2	0	5	32	39		4.99
	30 yellow	0	0	3	9	12		1.53
	31 mottled	0	0	0	6	6		0.77
	32 light gray	3	0	9	46	58		7.42
	33 dark gray	1	0	6	9	16		2.05
	34 light brown	13	1	58	135	207		26.47
	35 dark brown	2	0	31	33	66		8.44
	36 black	1	0	9	8	18		2.30
	37 blue	0	0	0	1	1		0.13
	38 red	0	0	3	12	15		1.92
	Subtotals	22	1	124	291	438		56.01
Totals		34	1	176	571	782		

Table 66. Southeast Range site group debitage by chert province and type

Province	Chert type	41BL155	41BL816	41BL827	Type Total	Percent of Identified	Percent of Total
Southeast Range	1, 10 HLB–LT	341	1	134	476	22.18	5.61
	2 CW	0	0	16	16	0.75	0.19
	6 HLT	912	5	47	964	44.92	11.36
	7 FPB	0	0	3	3	0.14	0.04
	9 HLTB	433	1	137	571	26.61	6.73
	13 ER-flecked	5	0	0	5	0.23	0.06
	Subtotals	1,691	7	337	2,035	94.83	23.98
West Fort	3 AMG	0	0	1	1	0.05	0.01
North Fort	8 FHY	29	0	28	57	2.66	0.67
	11 ERF	0	0	1	1	0.05	0.01
	14 FHG	0	0	1	1	0.05	0.01
	15 GBG	29	0	11	40	1.86	0.47
	17 OCB	6	0	1	7	0.33	0.08
	Subtotals	64	0	42	106	4.94	1.25
Cowhouse	18 CTT	0	0	1	1	0.05	0.01
	19 CDG	0	0	2	2	0.09	0.02
	20 CS	0	0	1	1	0.05	0.01
	Subtotals	0	0	4	4	0.19	0.05
Identified Subtotals		1,755	7	384	2,146		25.29
Indeterminate	29 white	833	16	319	1,168		13.77
	30 yellow	11	1	10	22		0.26
	31 mottled	17	0	3	20		0.24
	32 light gray	276	1	258	535		6.31
	33 dark gray	147	0	104	251		2.96
	34 light brown	2,855	8	774	3,637		42.86
	35 dark brown	416	3	177	596		7.02
	36 black	31	0	43	74		0.87
	37 blue	0	0	2	2		0.02
	38 red	13	2	19	34		0.40
	Subtotals	4,599	31	1,709	6,339		74.71
Totals		6,354	38	2,093	8,485		

Manning and Shell Mountains. On the other hand, Fort Hood Yellow, the most commonly used material in sites north of Cowhouse Creek (see Figures 83–85, 87, and 88; and Abbott and Tomka 1995:Figures 8.9 and 8.10), seems to occur in settings where only Edwards Limestone is present and in settings where undifferentiated Edwards, Fort Worth, and Duck Creek limestones crop out.

Based on these chert type distribution patterns, it seems that in the Southeast Range province (south of Cowhouse Creek) where undifferentiated Edwards Group formations crop out, Southeast Range chert types were selected. In similar undifferentiated Edwards Group settings north of the Cowhouse Creek, North Fort chert types were the material of choice, especially Fort Hood Yellow. On the other hand, in the vicinity of the Manning, Shell, Henson, and Twin Mountains where outcrops consist only of Fort Worth and Duck Creek Limestones, North Fort materials were preferred over Southeast Range cherts, although the latter materials constitute about one-third of the debitage in site groups near Manning and Shell Mountains (see Figure 88; and Abbott and Tomka 1995:Figures

Table 67. West Fort North site group debitage by chert province and type

Province	Chert Type	41CV944	Percent of Identified	Percent of Total
Southeast Range	6 HLT	11	2.56	1.09
	9 HLTB	14	3.26	1.38
	Subtotals	25	5.81	2.47
North Fort	8 FHY	405	94.19	39.98
Identified Subtotals		430		42.45
Indeterminates	29 white	15		1.48
	30 yellow	10		0.99
	31 mottled	4		0.39
	32 light gray	41		4.05
	33 dark gray	20		1.97
	34 light brown	340		33.56
	35 dark brown	62		6.12
	36 black	63		6.22
	37 blue	1		0.10
	38 red	27		2.67
	Subtotals	583		57.55
Totals		1,013		

8.7, 8.8, and especially 8.9).

In summary, these distribution trends suggest that there are some differences in the chert types found in areas where undifferentiated Fort Worth, Duck Creek, and Edwards Limestone formations occur, as compared to areas where only undifferentiated Fort Worth and Duck Creek formations or only Edwards Limestone occur. In addition, there appear to be some interesting patterns in the frequencies in which North Fort vs. Southeast Range chert types occur in undifferentiated Fort Worth, Duck Creek, and Edwards Limestone areas north and south of Cowhouse Creek and near the western edge of the installation. If these trends are further substantiated by additional comparisons based on larger site samples, it may be overly simplistic to view primary context chert distributions within the chert provinces as they are currently defined. Such trends might be more accurately understood if specific chert types could be correlated with specific chert-bearing limestone formations (i.e., Fort Worth, Duck Creek, and Edwards) across the project area. In addition, if these distributional trends stand up to greater scrutiny, it might be incorrect to view prehistoric chert procurement based on the current scenario which suggests a great deal of out-transport of Southeast Range cherts to the western and northwestern portions of the project area. That is, the presence of Southeast Range chert types in the western half of the military installation does not necessarily mean that these materials were preferred to such a degree that they were transported there from long distances. It might simply mean that they were used because they were available in the vicinity of the sites. The fact that Southeast Range province cherts constitute only about one-third of the types in the western portion of the base suggests either that North Fort materials were preferred, since they make up the remaining two-thirds, or that chert types were simply used in the same proportions as they naturally occurred in procurement sites in the vicinity.

These speculations raise a number of questions. For instance, are there differences in the proportions of Southeast Range vs. North Fort chert types in the undifferentiated Fort Worth, Duck Creek, and Edwards limestones found in sites north and south of Cowhouse Creek? Are the Seven Mile Mountain and Anderson Mountain chert types more like those from the Southeast Range south of Cowhouse Creek than those from the same undifferentiated formations north of Cowhouse Creek, and why? What is the distribution of Southeast Range and North Fort chert types in the eastern portion of Fort Hood where areas of undifferentiated Fort Worth, Duck Creek, and Edwards Limestone formations

Table 68. Cowhouse West site group debitage by chert province and type

Province	Chert Type	41CV1549	Percent of Identified	Percent of Total
Southeast Range	1+10 HLB-LT	2	1.14	0.56
	2 CW	4	2.29	1.12
	6 HLT	17	9.71	4.76
	7 FPB	1	0.57	0.28
	9 HLTB	5	2.86	1.40
	13 ER-flecked	17	9.71	4.76
	Subtotals	46	26.29	12.89
North Fort	8 FHY	100	57.14	28.01
	11 ERF	1	0.57	0.28
	14 FHG	4	2.29	1.12
	15 GBG	6	3.43	1.68
	Subtotals	111	63.43	31.09
Cowhouse	18 CTT	2	1.14	0.56
	19 CDG	13	7.43	3.64
	28 TRF	3	1.71	0.84
	Subtotals	18	10.29	5.04
Identified Subtotals		175		49.02
Indeterminate	29 white	12		3.36
	30 yellow	5		1.40
	31 mottled	1		0.28
	32 light gray	21		5.88
	33 dark gray	17		4.76
	34 light brown	86		24.09
	35 dark brown	24		6.72
	36 black	12		3.36
	37 blue	1		0.28
	38 red	3		0.84
	Subtotals	182		50.98
Totals		357		

interdigitate with areas where only Edwards Limestone is exposed? Were Southeast Range chert types actually preferred over North Fort cherts by peoples with equal access to both source areas, or do the chert type distribution data simply reflect differences in the availability of materials on a local level? It may be possible to address these types of research questions through continued archeological work at campsites across the project area; however, there is no substitute for careful survey and systematic documentation of the distribution of chert types across the installation in both primary and secondary contexts. It is unrealistic to think that the chert procurement and lithic technology (e.g., selection of raw materials, reduction strategies, and sequences) of the region's inhabitants can be reconstructed and fully understood without knowing more precisely where various types of raw materials were found, in what proportions they occurred, how accessible they were, and what the qualitative differences (quantifiable rather than subjective) between chert types are and how such differences might have affected prehistoric lithic use. Much of the work to provide a basic description of the lithic landscape and define the natural properties and geographic distributions of various chert resources remains to be carried out.

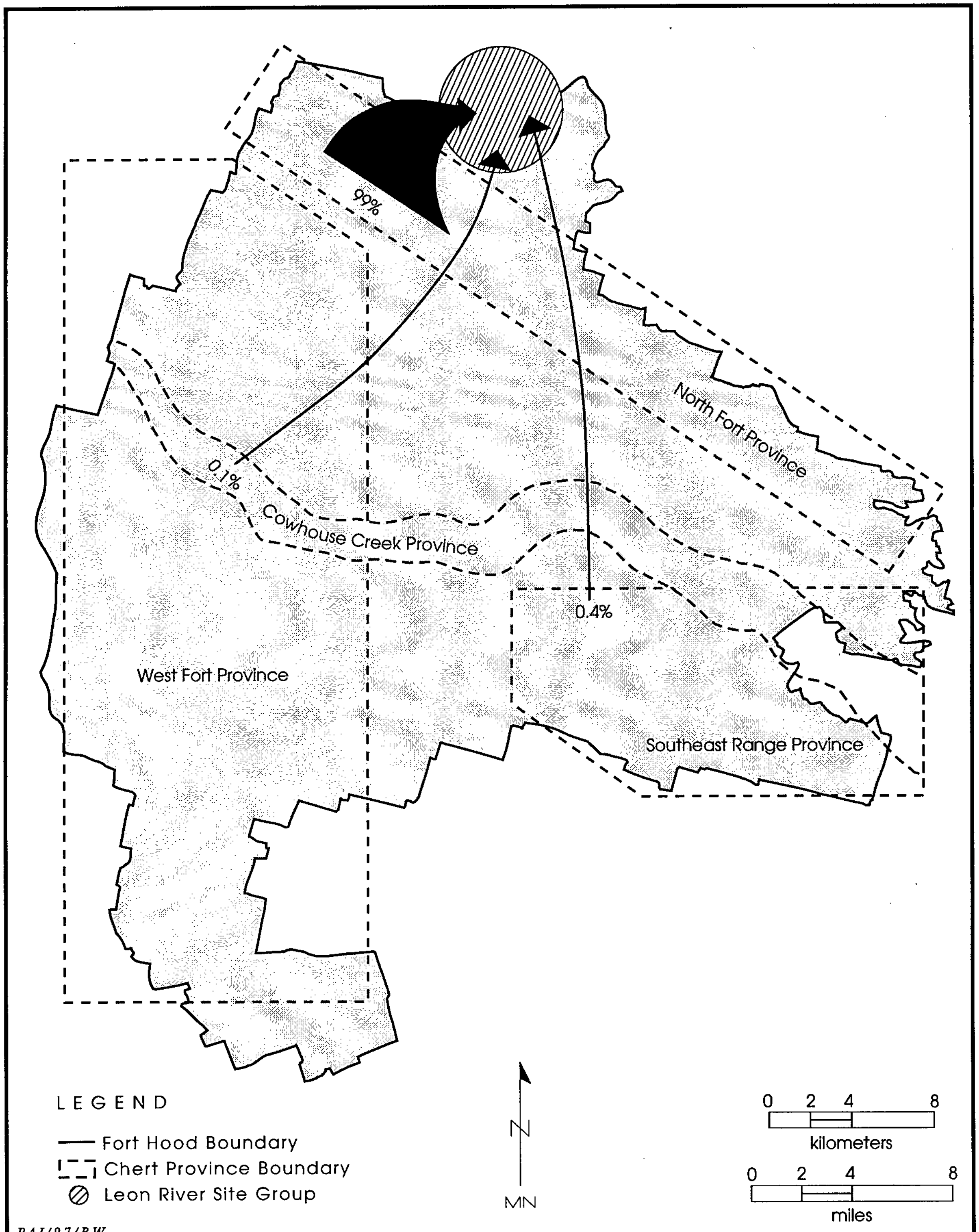

Figure 83. Map of chert source areas represented in the debitage sample, Leon River site group.

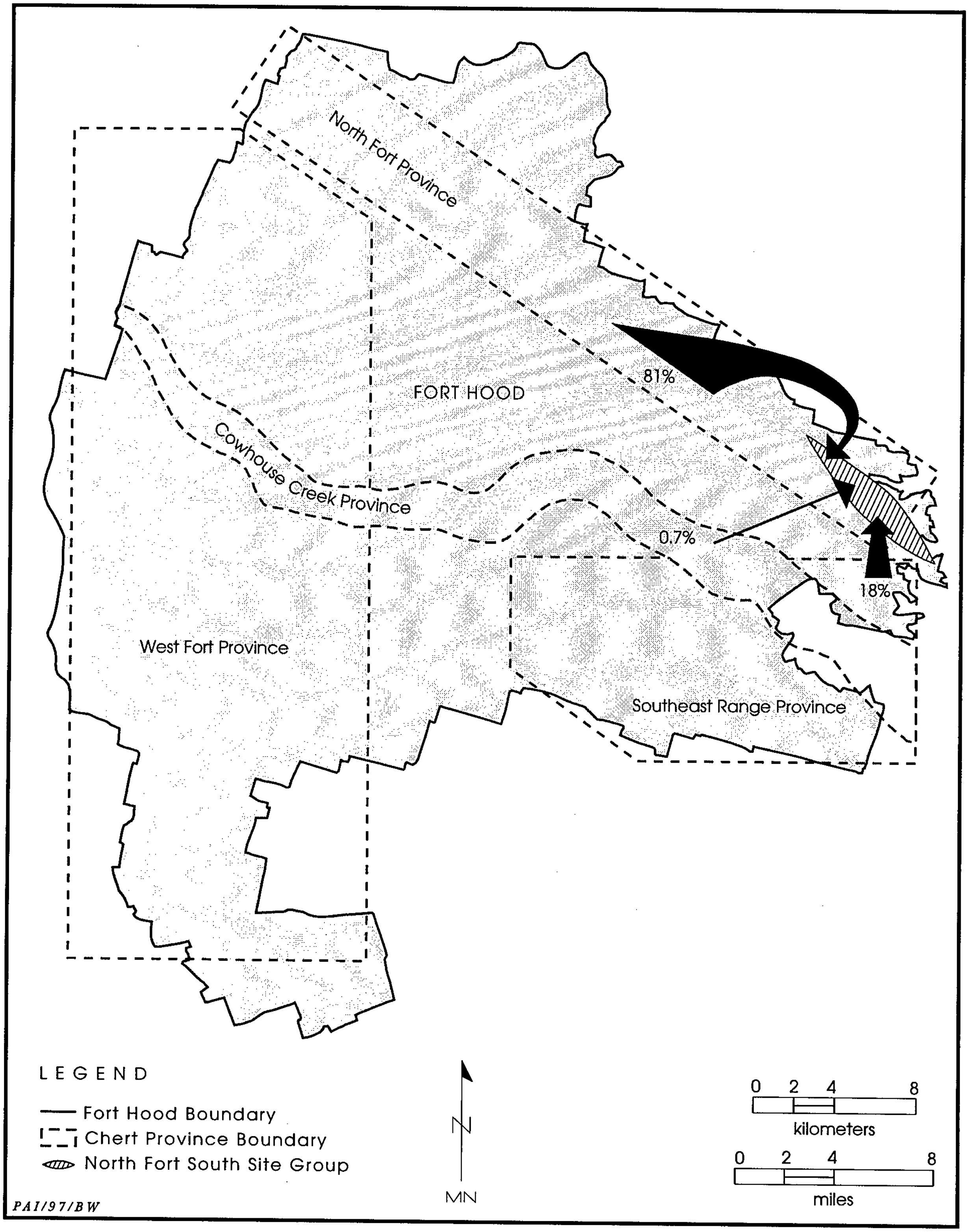

Figure 84. Map of chert source areas represented in the debitage sample, North Fort South site group.

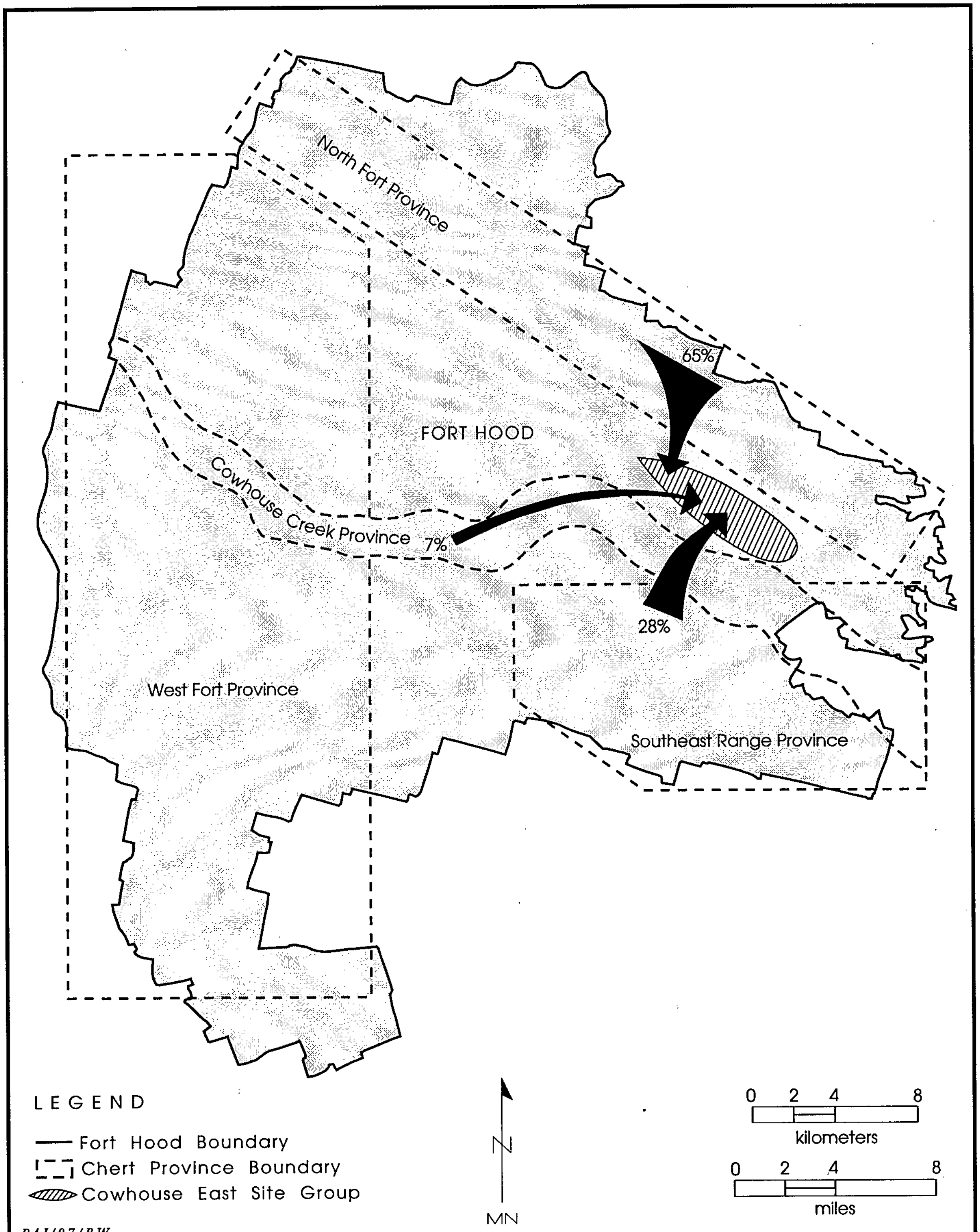

Figure 85. Map of chert source areas represented in the debitage sample, Cowhouse East site group.

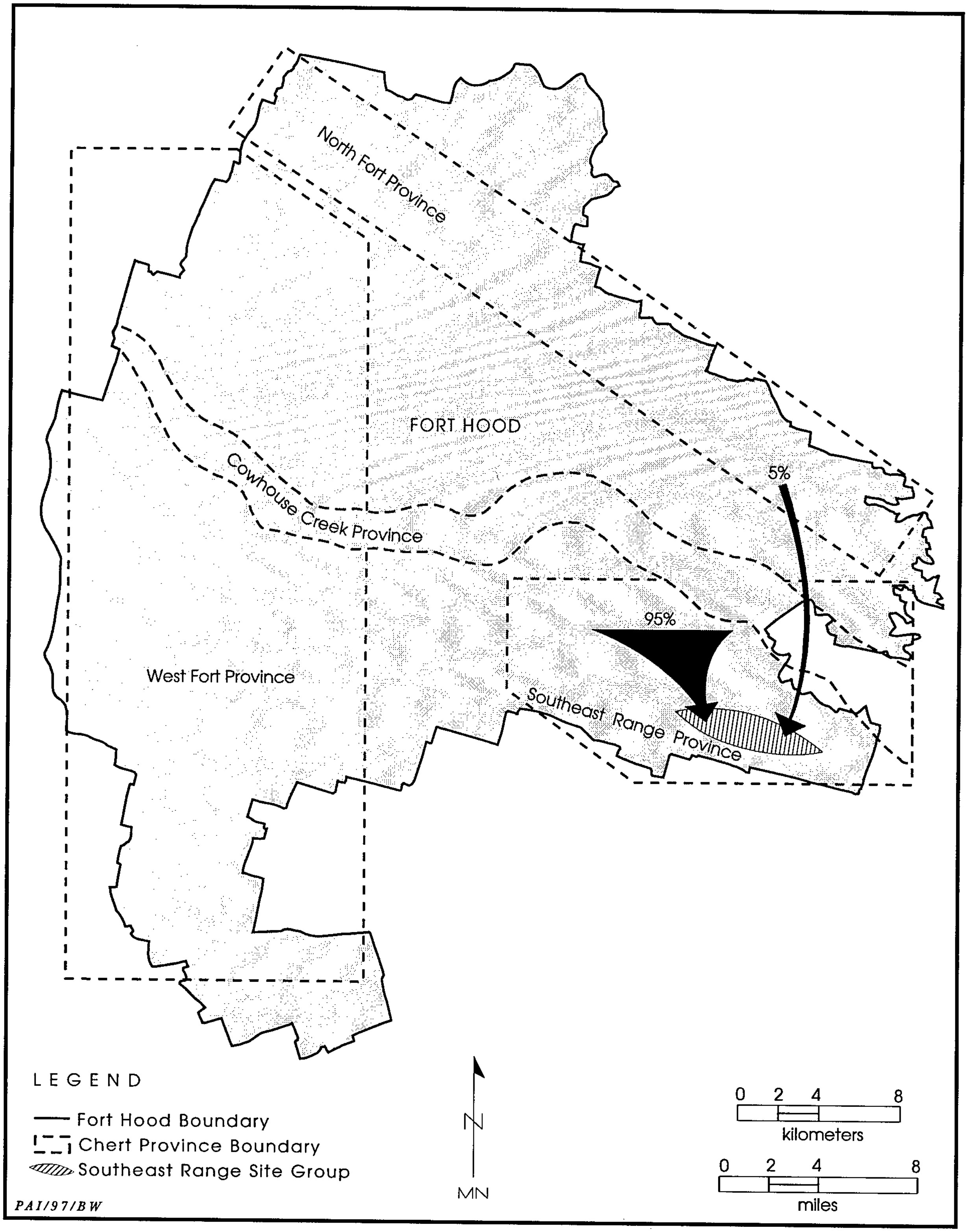

Figure 86. Map of chert source areas represented in the debitage sample, Southeast Range site group.

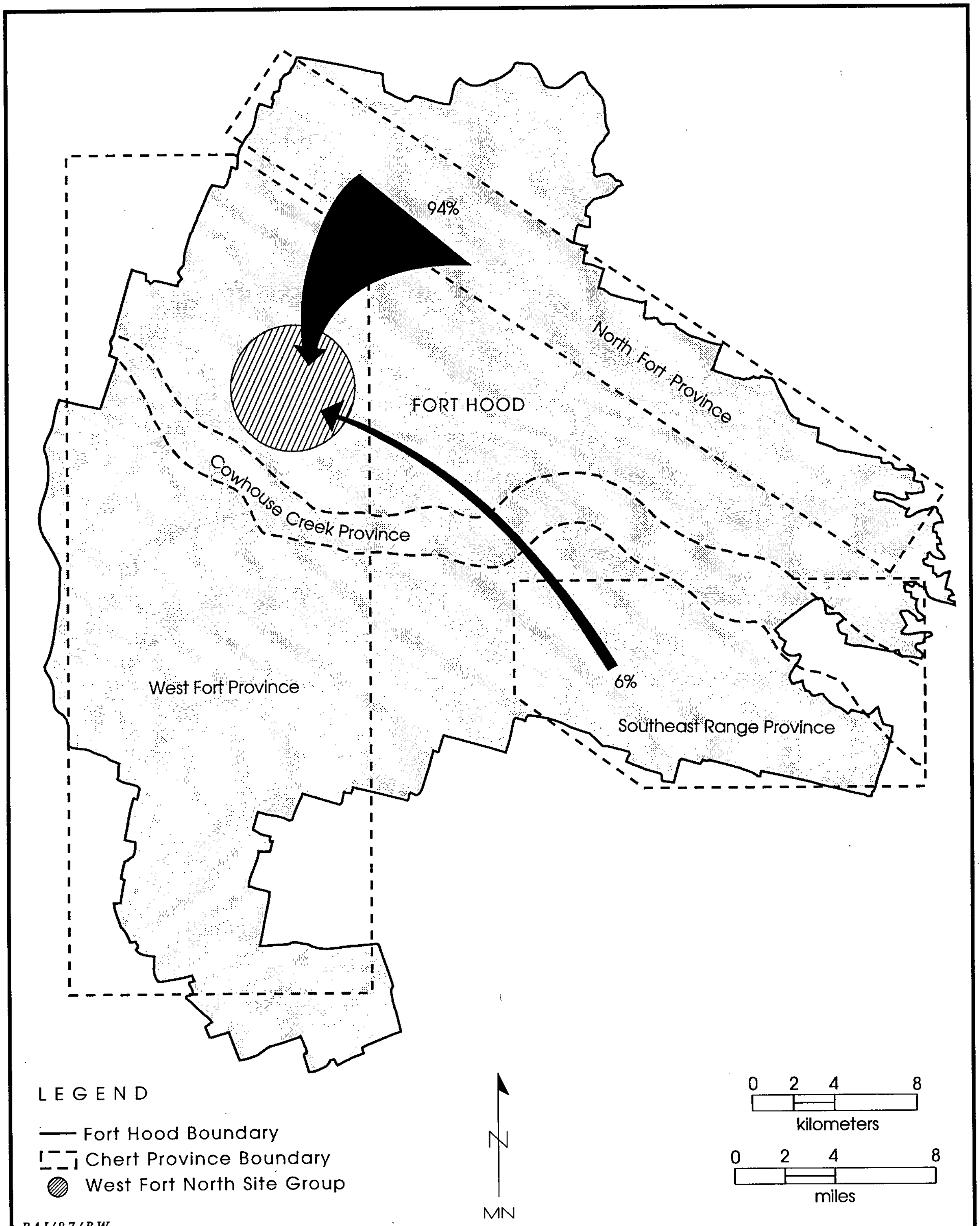

Figure 87. Map of chert source areas represented in the debitage sample, West Fort North site group.

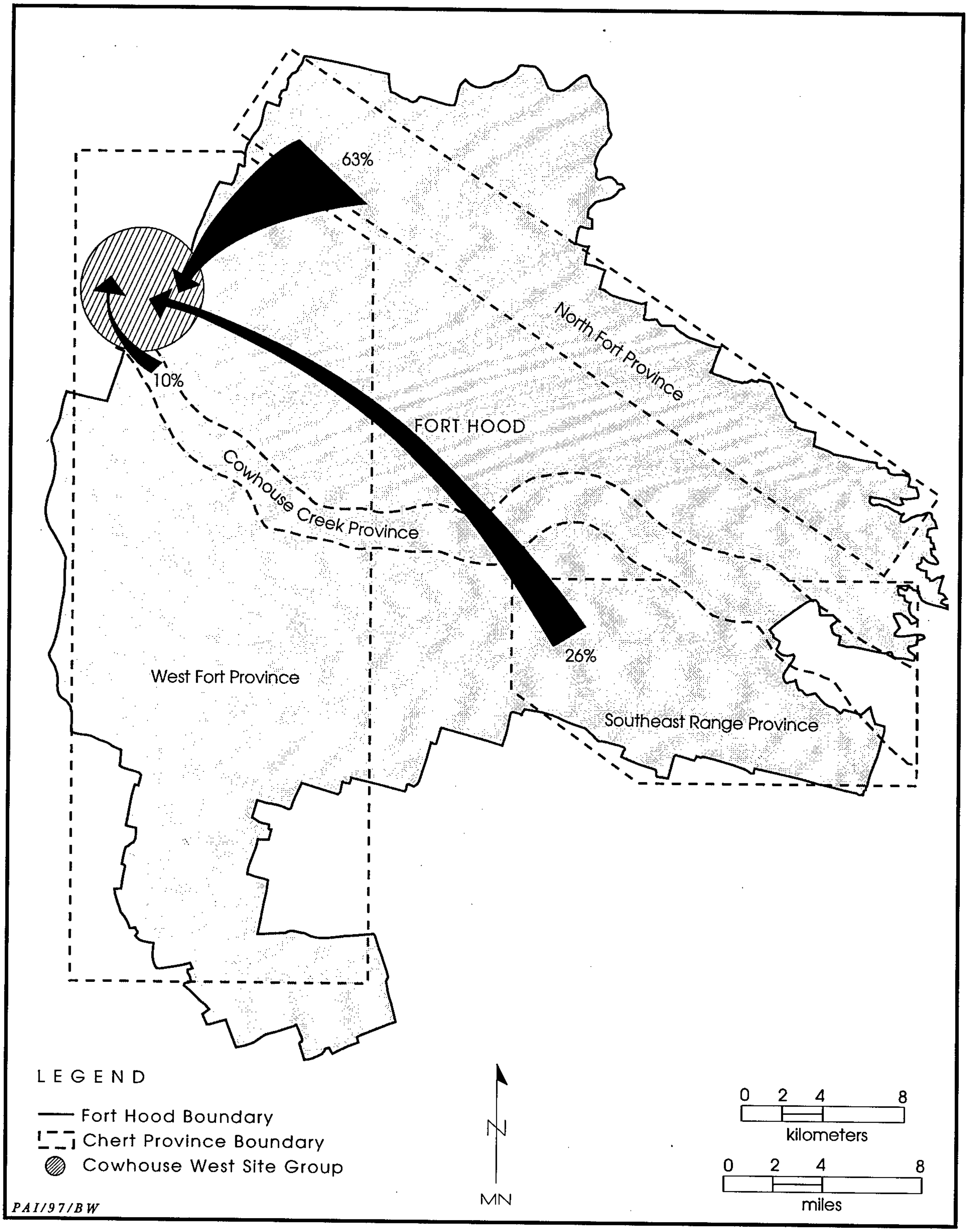

Figure 88. Map of chert source areas represented in the debitage sample, Cowhouse West site group.

NATIONAL REGISTER EVALUATIONS AND MANAGEMENT RECOMMENDATIONS

Douglas K. Boyd, Karl Kleinbach, and Gemma Mehalchick

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Nineteen prehistoric sites were investigated during the 1995 field season. In this chapter, these sites are evaluated relative to the National Register of Historic Places (NRHP) criteria defined in the Fort Hood research design by Ellis et al. (1994) and summarized in Chapters 3 and 4. The first section presents the recommendations for NRHP eligibility for all of the tested sites, as well as recommendations for further work at sites deemed to be eligible for listing in the NRHP. This section also discusses site significance based on comparisons between sites in similar geomorphic/physical settings (i.e., the site groupings established in Chapter 8). Under the headings of rockshelters, Leon River sites, and other open sites, site-specific recommendations for NRHP eligibility and for protection and/or data recovery investigation are made. The second section presents programmatic recommendations pertaining to long-term management of different types of cultural resources at Fort Hood.

RECOMMENDATIONS FOR NATIONAL REGISTER ELIGIBILITY AND FURTHER INVESTIGATIONS

The current prehistoric site testing program at Fort Hood is designed primarily to evaluate NRHP eligibility of individual sites. Site evaluations are based on the context and contents of the cultural deposits and the potential each site has for addressing regional archeological research problems. The Fort Hood research design reasons that the nature and integrity of the archeological evidence at each site should be used to evaluate NRHP significance with respect to each site's ability to contribute data for resolving specific research questions currently defined by the archeological community as worthy of attention (Ellis et al. 1994:180). Judging a site's ability to yield useful information must be based on comparisons of sites with similar characteristics; similar types of sites can be rated against one another on the basis of how well the data they contain can contribute to the current archeological issues. For this reason, the ensuing discussions of site assessments and programmatic recommendations follow the format of site groupings established in the previous chapter. Recommendations of NRHP eligibility for the 19 sites (or subareas thereof) that were tested in 1995 are summarized in Table 69.

As explained below, the 14 sites/subareas that are recommended as not eligible for listing on the NRHP fail to meet the basic data needs defined in the Fort Hood site significance model. With respect to this model (see data needs questions presented in Chapter 3), these sites and subareas have contextual fatal flaws. Consequently, current evidence indicates that these sites/subareas have little or no research potential and warrant no further work.

Eleven of the sites/subareas are recommended as eligible for listing in the NRHP because they have demonstrably good contextual integrity. As summarized in Table 70, all of the sites/subareas recommended as eligible meet one or more of the four specific essential data needs criteria necessary to demonstrate their research potentials.

The data obtained from each of the sites/subareas recommended as being eligible for inclusion in the NRHP are useful to varying degrees for planning a data recovery strategy and/or estimating level of effort for mitigation. In some cases, such as for sites with cultural deposits restricted to spatially limited landforms

Table 69. Summary of National Register eligibility recommendations

Site	Subarea, Shelter	Site Grouping	NRHP Eligibility Recommendation
41BL69	Subarea B, Shelter A	Rockshelter	not eligible
	Subarea C, Shelter B	Rockshelter	eligible
41BL155	Subarea B	Other Open Site	eligible
41BL181	–	Rockshelter	not eligible
41BL579	Subarea B, Shelter B	Rockshelter	not eligible
	Subarea B, Shelter C	Rockshelter	not eligible
41BL581	Subarea B, Shelter B	Rockshelter	eligible
41BL582	Subarea A, Shelter A	Rockshelter	eligible
	Subarea A, Shelter B	Rockshelter	not eligible
41BL667	–	Rockshelter	not eligible
41BL816	Subarea A	Other Open Site	not eligible
41BL827	–	Rockshelter	eligible
41CV722	–	Other Open Site	eligible
41CV944	Subarea C, Shelter A	Rockshelter	not eligible
	Subarea C, Shelter B East	Rockshelter	not eligible
	Subarea C, Shelter B West	Rockshelter	not eligible
41CV1348	Subarea A, Shelter 1	Rockshelter	not eligible
	Subarea A, Shelter 2	Rockshelter	not eligible
41CV1473	–	Leon River Open Site	not eligible
41CV1478	–	Leon River Open Site	eligible
41CV1479	–	Leon River Open Site	eligible
41CV1480	–	Leon River Open Site	eligible
41CV1482	–	Leon River Open Site	eligible
41CV1487	–	Leon River Open Site	not eligible
41CV1549	–	Other Open Site	eligible

(e.g., rockshelters and open sites in small alluvial terraces), site data can provide a sound basis for making a reliable estimate of the level of work that would be required for mitigation (i.e., comprehensive data recovery excavations). In other instances, such as for large open sites with buried cultural deposits contained within extensive alluvial terraces, site boundaries are not firmly established and the horizontal distribution of artifact concentrations and features within sites is poorly known. In these cases, the site data are not sufficient to justify recommending an appropriate level of effort for a complete mitigation program, and additional testing would be required before embarking on a major data recovery effort. Consequently, recommendations for further work at these large sites are limited to suggestions of the appropriate level of intensive testing necessary to obtain sufficient information to adequately plan a data recovery strategy. Table 71 summarizes the recommendations for further work at the 11 sites/subareas recommended as eligible for listing in the NRHP.

Rockshelters

Of the 15 rockshelters tested, 11 are assessed as not eligible for listing in the NRHP, while 4 are recommended as eligible (see Table 69). The ineligible shelters are judged as such because no intact cultural deposits were identified during testing. As discussed in Chapters 5 and 6, the deposits within eight of these shelters (i.e., Shelter A at 41BL69; 41BL181; Shelters B and C at 41BL579; 41BL667; and Shelters A, B-East, and B-West at 41CV944) have been severely disturbed, primarily by vandalism. The remaining three ineligible shelters (Shelter B at 41BL582

Table 70. Summary of key data needs for National Register–eligible prehistoric sites*

Site	Subarea, Shelter	Does the site contain: Identifiable and/or datable bones or shells?	Macrobotanical remains?	Features with economic or chronometric potential?	Multiple and spatially separated features?	Burned rock middens or mounds?	Unique and/or nonlocal artifacts or concentrations of artifacts or features?
ROCKSHELTERS							
41BL69	Subarea C, Shelter B	yes	yes	yes	unknown	no	intact burial
41BL827	–	yes	yes	yes	unknown	yes	–
41BL581	Subarea B, Shelter B	yes	yes	yes	unknown	nc	sealed Paleoindian component
41BL582	Subarea A, Shelter A	yes	yes	yes	unknown	no	paleoenvironmental and cultural data sealed in tufa
LEON RIVER SITES							
41CV1478	–	yes	yes	yes	unknown	no	–
41CV1479	–	yes	yes	yes	unknown	no	rock-filled pit of unknown function
41CV1480	–	yes	yes	yes	yes	no	–
41CV1482	–	yes	yes	yes	yes	no	–
OTHER OPEN SITES							
41BL155	Subarea B	yes	yes	yes	yes	yes	nonlocal sandstone metate
41CV722	–	yes	yes	yes	yes	yes	–
41CV1549	–	yes	yes	yes	yes	no	–

* As specified by Ellis et al. (1994:187–188) and presented in Table 4.

Table 71. Recommendations for data recovery or intensive testing of National Register–eligible sites

		Estimated site area and depth		Recommended effort for intensive testing		Recommended effort for comprehensive date recovery
Site	Subarea, Shelter	area (m^2)	depth (cm)	# of trenches	# of test units	Volume of hand excavations (m^3)
ROCKSHELTERS						
41BL69	Subarea C, Shelter B	50	50	–	–	25
41BL581	–	40	100	–	–	40
41BL582	Subarea B, Shelter B	15/22*	80/80*	–	–	30
41BL827	Subarea A, Shelter A	12/120*	50/100*	–	–	126
LEON RIVER SITES						
41CV1478	–	1,800	205+	8	6–8	unknown
41CV1479	–	960	220+	6	6–8	unknown
41CV1480	–	750	270+	6	4–6	unknown
41CV1482	–	2,800	190+	12	10–12	unknown
OTHER OPEN SITES						
41BL155	Subarea B, North Terrace	4,800**	50	–	–	163
41CV722	–	21,250	40	–	–	140 (plus 2–4 backhoe trenches)
41CV1549	–	28,000	200+	16	8–12	unknown

* First number is for deposits inside shelter; second number is for talus deposits.
** Actual size of northern terrace at 41BL155

and Shelters 1 and 2 at 41CV1348) contain thin sediments and sparse cultural materials that most likely were redeposited from the uplands. No further work is recommended for these 11 shelters because they can contribute little or no data pertinent to current research issues.

For the four NRHP-eligible shelters, at least three of the essential data needs were demonstrated to exist within the deposits (see Table 70). Because these shelters have a high research potential, further archeological work is recommended. As discussed in more detail under Programmatic Recommendations, comprehensive data recovery is the preferred alternative for managing these rockshelters; the site protection measures currently employed (e.g., avoidance and/or monitoring) have proven to be ineffective in reducing the ongoing threat of destruction by vandalism. Each of the eligible shelters is relatively small in size, and the information obtained from the FY 1995 testing program is sufficient to estimate a reasonable level of effort for data recovery.

Shelter B at 41BL69 contains an intact primary burial and probable occupational remains in undisturbed deposits. Although human remains are relatively common within rockshelters on Fort Hood, only three intact burials have been identified. Hence, this shelter not only contains valuable information about prehistoric mortuary practices and paleodiet, it also contains cultural materials in an undisturbed depositional context which can potentially provide substantial data on rockshelter use. Approximately 45–50 m^2 of deposits are present within the shelter, and the depth of these deposits is thought to be no more than 50 cm. Therefore, comprehensive data recovery would involve manual excavation of approximately 25 m^3 of cultural deposits.

Shelter B at 41BL581 contains a Paleoindian component sealed within highly weathered but intact deposits. Because this is the only known rockshelter on Fort Hood containing deposits of such great antiquity, it is extremely significant and has the potential to yield valuable information concerning the lifeways of the earliest inhabitants of the region. The deposits may also yield considerable data for paleoenvironmental research and the geomorphic processes involved in rockshelter evolution. Approximately 40 m^2 of deposits, estimated to be 1 m thick, are contained within the deepest portion of the shelter. A minimum volume of 40 m^3 would need to be manually excavated for comprehensive data recovery. Although no appreciable deposits were observed outside the shelter, additional prospection for cultural materials and data for environmental and geomorphic reconstruction should be done in the talus area.

Shelter A at 41BL582 contains cultural deposits that exhibit some disturbance but are largely intact. Furthermore, a flowstone (tufa) deposit located within the shelter has sealed in ca. 2–3 m^3 of sediment containing cultural materials and paleoenvironmental evidence. The data obtained during testing indicates that the shelter was inhabited only during the Late Archaic period. If this is the case, the deposits have the potential to provide substantial data for interpreting technology, subsistence strategies, and paleoclimate for a specific time period. Careful investigation of the tufa deposit may yield information on rockshelter evolution and ground water discharge sequences, in addition to paleoenvironmental data. Approximately 15 m^2 of cultural deposits, estimated to be 80 cm thick, are contained within the shelter itself. The talus encompasses approximately 22 m^2 of deposits up to 80 cm deep; however, only about half of this area (i.e., the level talus bench) is known to contain intact occupational evidence comparable to that in the shelter. The other half of the talus slopes sharply to the edge of a small drainage. Therefore, a minimum data recovery effort of ca. 30 m^3 of manual excavation is needed to examine all of the deposits within the shelter and on the talus.

Site 41BL827 is comprised of a small rockshelter and a relatively large associated talus, both of which contain considerable amounts of cultural materials. Although deposits in some areas have been vandalized, large sections of the shelter and talus remain intact. In addition, with the possible exception of the lowermost portion of the talus, all of the cultural materials appear to be associated with Late Prehistoric occupations. Thus, as in the case of Shelter A at 41BL582, this site can provide significant evidence about adaptive strategies and rockshelter use during a specific time period. Approximately 12 m^2 of undisturbed cultural deposits, averaging 50 cm thick, remain within the shelter, along with approximately 120 m^2 of undisturbed, 100-cm-deep cultural deposits within the talus. Numerous large boulders are

located along the edges of and surrounding the undisturbed portion of the talus. If data recovery includes the undisturbed deposits within the shelter and the majority of the deposits in the central part of the talus, it is estimated that a minimum of 126 m^3 of deposits would need to be manually excavated.

Leon River Sites

Of the six tested sites along the Leon River, 41CV1473 and 41CV1487 are assessed as ineligible for listing on the NRHP (see Table 69). The former site is located on a Jackson (Pleistocene) alluvial terrace (T_2) and contains evidence of multiple occupations mixed and compressed within a thin mantle of reworked colluvial sediments. The latter site, located on the south bank of the Leon River, produced few cultural materials. No intact cultural features and only sparse organic remains were found at each of these sites, and no further work is recommended.

The remaining four tested Leon River sites—41CV1478, 41CV1479, 41CV1480, and 41CV148—are judged to be eligible for listing in the NRHP. At each of these sites, discrete occupational layers with intact cultural features containing interpretable organic remains are sealed within the alluvial sediments (see Table 70). Because these occupational layers are generally buried at a depth of over 1 m within the Leon River paleosol, avoidance and protection are the preferred alternatives for managing these sites. Although the cultural deposits are fairly well protected from most forms of manmade disturbances (including vandalism) due to the depths at which the occupations occur, each is partially exposed in stream cutbanks. These sites should be protected from tracked and wheeled vehicular traffic and other disturbances by machines, which would in turn limit the impact of erosion.

It was not feasible under the current testing program to investigate the entire vertical expanse of the Holocene deposits in these deep alluvial settings (particularly at 41CV1480 and 41CV1482). The current investigations generally targeted the upper 2 to 2.5 m of sediment where occupational evidence was known or suspected to exist. Consequently, the vertical distributions of occupational evidence are not well defined, and each of these sites has the potential to produce cultural evidence below the level of testing. For all practical purposes, however, archeological remains that might exist below ca. 2 m are not endangered by any regular Army activities that occur at Fort Hood, and they are difficult to sample mechanically without destroying significant amounts of cultural evidence in the upper levels. Similarly, it was not possible to discover the full extent of the site with backhoe trenching or hand-dug units within the scope of this testing project.

Because the vertical and horizontal distributions of the cultural occupations are not well defined, it is impossible to reliably estimate the level of effort necessary for complete data recovery at these sites. No specific recommendations for data recovery are made; however, a minimum excavation effort of 100–150 m^2, to be concentrated in large excavation blocks, is suggested as an appropriate level of effort to sample each buried cultural occupation zone that is targeted. Before a mitigation effort could be undertaken, however, further testing is needed to trace the horizontal and vertical extent of the occupational evidence and to provide better data before deciding where to put block excavations. Table 71 presents a rough estimate of the horizontal extent of the cultural deposits at these sites, along with a recommendation for more-intensive mechanical and hand testing of deposits. These recommendations assume that this intensive testing is aimed primarily at better sampling and defining the known cultural deposits, but some attempt at sampling the deeper sediments also should be made if additional work is done at any of these sites. A brief review of each of these sites, with recommendations for intensive testing, is presented below. It is also suggested that mechanical stripping of sediments to remove overburden may be warranted.

Site 41CV1478 contains intact Late Archaic and Late Prehistoric occupation surfaces between 150 and 210 cm. The southern and eastern site boundaries are defined by a stream meander, and the western margin is fairly well established based on the results of subsurface testing (i.e., no cultural materials were observed in the trench excavated farthest from the drainage). The northern site boundary, however, is essentially unknown. Because occupational evidence could extend a considerable distance along the terrace, a minimum of eight backhoe trenches is recommended for site boundary closure. Depending on trenching results, 6 to

8 m^2 of manually excavated test units may be needed to sample cultural remains associated with the identified occupations. If it is found that the site does not extend much farther to the north, then data recovery should focus on the vicinity of the identified occupations adjacent to Backhoe Trenches 1 and 2.

Site 41CV1479 contains a sealed Austin phase component buried at ca. 170 to 220 cm. The southern site boundary is defined by a drainage. Only sparse cultural materials were observed within the trenches excavated at the eastern and western margins of the site, thereby providing a reasonable basis for establishing the limits of the site in these directions. The extent of the occupational evidence to the north (away from the drainage) is unknown, and a minimum of six backhoe trenches is recommended to expose possible cultural deposits in this direction. Depending upon the results of trenching, 6 to 8 m^2 of manually excavated units may be required to adequately sample the component. If the site is found to be restricted to the area near the drainage, then data recovery efforts should concentrate on the area adjacent to Backhoe Trench 2.

Site 41CV1480 contains a sealed Toyah phase component buried at ca. 150–190 cm. Based on the findings in the three backhoe trenches, the site appears to be restricted to a narrow (ca. 10 m) strip along the Leon River cutbank. If this is the case, then mitigation should focus on the area adjacent to Test Unit 1. However, to verify this, at least six backhoe trenches need to be excavated in an arc around this area. The trenches should be excavated in a manner that allows examination of sediments below 2 m. Depending upon the results of this additional trenching, 4 to 6 m^2 of manually excavated test units may be needed to define the site's boundaries, sample the known component, and/or sample deeper archeological remains.

Site 41CV1482 contains several sealed components with occupations representing the Late Archaic and Late Prehistoric periods. These components are located between 100 and 200 cm over a broad expanse of the alluvial terrace. Although the western site boundary is defined by the Leon River and the southern boundary is defined by a tributary drainage, the site could extend much farther to the north and east and may contain more occupational evidence below 2 m. Therefore, a minimum of 12 backhoe trenches is recommended as a starting point for defining the site's boundaries and searching for possible deeply buried components. Adequate sampling of the multiple components buried at 1–2 m and any archeological remains buried at a depth greater than 2 m may require 10 to 12 m^2 of manually excavated test units.

Other Open Sites

Within this group of sites, only 41BL816 is assessed as ineligible for listing in the NRHP (see Table 69). As was the case for the other sites determined to be ineligible, this site contains no intact cultural deposits. It is situated on a colluvial slope, and no cultural features or organic remains were located within the reworked sediments. The remaining three sites, 41BL155, 41CV722, and 41CV1549, are recommended as eligible. At least four of the key data set requirements for site eligibility are met at each (see Table 70).

Subarea B of 41BL155 contains a relatively undisturbed burned rock midden at 0–50 cm in an alluvial terrace of a small stream. In addition to a large quantity of cultural materials apparently representing repeated Late Archaic occupations, an intact internal feature (i.e., a slab-lined hearth or baking pit) is contained within the midden. Because the horizontal and vertical extents of this portion of the site are well defined, further testing is not needed prior to data recovery. We recommend that data recovery be done using an approach somewhat similar to that advocated by Black et al. (1997) in their recent review of "hot rock cooking" on the Edwards Plateau. They suggest that the focus of burned rock midden mitigative efforts should be on exposing large areas to document midden structure. Observations of burned rock middens at Fort Hood suggest that this site may indeed contain multiple internal hearths buried in the terrace sediments over a large area. In such a setting, searching for and carefully investigating such internal features is the most productive approach to finding clues as to how and why the midden formed over time. It is generally true that the midden matrix found between internal features is a homogenous zone of smaller burned rock fragments, artifacts, and organic remains that represents accumulated deposits (i.e., from throughout the midden's

occupational/use history) that are often impossible to sort out. While it is important to adequately sample and characterize the midden matrix, the mitigative efforts should focus on internal features because they generally represent discrete activities or events, contain organic remains that are datable and provide chronological control, and often yield interpretable and coherent assemblages of associated artifacts and macrobotanical and faunal remains.

Since the horizontal extent of the midden is well defined, there is no need to excavate additional backhoe trenches and run the risk of destroying internal hearths. An investigative strategy combining mechanical excavation using a Gradall and hand-excavated units is considered to be the most productive approach. Additional hand excavation is needed to expose a large area around the internal hearth already identified (Feature 2); a 5x5-m block excavated to 50 cm below the surface is sufficient for this. Next, mechanical stripping using a Gradall for accurate and careful horizontal control is recommended as a cost-effective means of exposing a large portion of the site to identify internal features. A series of north-south Gradall trenches, excavated perpendicular to the drainage, should be used to slowly expose the top of the midden so that it is possible to recognize internal features. Although we do not advocate using all of the experimental archeological methods employed during the midden excavation at the Higgins site (Black et al. 1993), a Gradall was successfully used to expose that midden and identify its internal features. Black et al. (1997) recommend that the exposed areas be viewed from oblique overhead angles to see internal structure that might otherwise be invisible. Based on the results of the initial Gradall stripping, additional decisions would be made regarding when and where to continue stripping and when and where to begin hand excavations. We recommend that a minimum of three hundred 1x1-m excavation units be allocated for sampling the midden and its internal features. The majority of these units should be contiguous (i.e., in excavation blocks) to expose large areas, but some might be used as isolated sampling units. If this basic strategy is employed, the total hand-excavation effort for data recovery would be 325 m^2, for a total excavation volume of ca. 163 m^3.

There are alternative, nondestructive approaches to identifying site structure that should be given some consideration. Because the midden is generally shallow (i.e., in the upper 50 cm) and situated in a confined and open (i.e., not densely vegetated) terrace, remote sensing might be effective for locating burned rock features composed of large slabs within a matrix of smaller fire-cracked debris. This site might be a good test case for attempting nondestructive survey using proton magnetometer, electric resistivity, ground penetrating radar, or other remote sensing techniques.

Site 41CV722 contains evidence of Late Archaic and Late Prehistoric occupations in at least three different geomorphic settings within a small tributary valley adjacent to the upland Manning surface: the alluvial sediments on the valley floor, the colluvial sediments on the eastern valley slope and bench, and the colluvial sediments on the toeslope where colluvium drapes over the alluvial terrace. Despite the fact that the colluvial and alluvial sediments in this small valley may represent a moderate to high energy depositional environment, two observations suggest that the site has a high research potential. First, there is considerably less evidence of high energy deposition than one might expect in such a setting, and the sediments appear to represent periods of landform stability punctuated by periods of rapid alluvial and/or colluvial deposition. Secondly, there is evidence of stratification of occupational debris, including discrete burned rock features that appear to be largely intact. Consequently, in addition to meeting the content requirements for NRHP eligibility, the context of the cultural deposits appears to be relatively good. While one may argue that the context of these archeological remains is poorer than comparable occupational evidence found in the deep alluvial terraces of the major streams, this comparison is not appropriate. Low-order tributaries away from the major streams represent a relatively unknown part of the prehistoric landscape at Fort Hood. Sites located in these settings (41CV722 is an excellent example of such) have received almost no serious attention. Little is known about their geomorphic characteristics or cultural attributes, but one would expect that the prehistoric occupations and activities that occurred in these settings were quantitatively and qualitatively different from occupations in the larger stream valleys. For example, did

occupations in low-order tributaries occur at different times of the year and/or were they keyed to specific resources available on the Manning surface or its slopes?

Some general recommendations may be offered with respect to implementing a data recovery program at 41CV722. The objectives of data recovery would be twofold. Archeologically, the investigation would be aimed at defining cultural activities at the site and addressing research design questions proposed by Ellis et al. (1994). In addition, the data recovery program should attempt to obtain detailed sedimentological data useful for better defining the geomorphic processes and depositional contexts within low-order stream valleys. To obtain a minimally adequate sample of occupational evidence and geomorphic data, a combination of mechanical and manual excavations is proposed. It would be helpful to use a backhoe (ca. 2–4 trenches) to trench east-west across the western terrace and toeslope to get a better idea of the alluvial/colluvial interface before beginning hand excavations. Then data recovery excavations should focus on two areas: the eastern colluvial slope and bench (i.e., Analysis Unit 1), and the western alluvial terrace and its interface with the colluvial toeslope (i.e., Analysis Units 2 and 3). Up to 10 additional isolated units should be excavated (to an average depth of 50 cm) in each of these areas to determine where excavation blocks would be most productive. The eastern colluvial slope and bench could then be sampled with a minimum excavation block of ca. one hundred 1x1-m units excavated to an average depth of 40 cm; the western terrace and toeslope could be sampled with a minimum excavation block of one hundred 1x1-m units excavated to an average depth of 100 cm. Thus, a total manual excavation volume of 84 m^3 would be needed to sample the features and artifacts at 41CV722 for data recovery.

Site 41CV1549 contains stratified Late Archaic components with multiple intact cultural features at various depths, widely scattered in the deposits of the T_1 terrace of Cowhouse Creek. All of these components are contained within the upper 2 m of West Range alluvium, while older Georgetown alluvial sediments identified on the site are culturally sterile. In addition, a sealed Late Prehistoric component is buried in the adjacent T_0 floodplain deposits representing Ford over West Range sediments. Although the south and east site boundaries are defined by natural landform breaks (drainages that cut into the terraces) and the western boundary is fairly well defined by the extent of cultural materials observed within trenches, only a small portion of the large floodplain was investigated. Site geomorphology is complex, and the buried components that have been recognized are not well defined. Therefore, it is impossible to make a reasonable estimate of an appropriate level of data recovery at this time. More-intensive testing would be needed prior to formulating a data recovery plan, and a minimum of 16 backhoe trenches is recommended to accomplish the following: (1) establish the northern site boundary on the floodplain; (2) better define the horizontal extent of the known components; (3) expose the full vertical extent of alluvial sediments and search for possible cultural materials buried at depths greater than 2 m; and (4) provide additional exposures of the older alluvial unit. Additional test units also would be needed to provide a better sample of the cultural deposits. The precise number of hand-excavated test units needed will be dependent on trenching results, but it is likely that 8 to 12 units (1x1 m) would be sufficient. If it is found that the site does not extend farther north across the floodplain and no deeper occupations are located, then data recovery excavations should focus in the vicinity of the identified occupations adjacent to Backhoe Trenches 4, 6, 7, 12, and 13. As with the Leon River sites, it is suggested that a minimum of 100–150 m^2, primarily clustered in large excavation blocks, is appropriate for sampling each buried cultural zone being targeted. Mechanical stripping to remove overburden also may be warranted.

PROGRAMMATIC RECOMMENDATIONS AND CONCLUSIONS

This final section evaluates the investigative methods employed during the current analysis and makes general recommendations for the Fort Hood Cultural Resources Management Program. Because most of the testing done during FY 1995 involved rockshelters (with and without burials) and open sites along a short segment of the Leon River, programmatic recommendations are limited to these site groups.

Analytical Results

The lithic analysis conducted during the FY 1995 testing project is comparable to the level of analysis normally employed by Prewitt and Associates for site testing projects. The Fort Hood Cultural Resources Management Program dictates a very limited level of site testing aimed at quickly identifying the presence or absence of specific types of archeological evidence to assess NRHP eligibility. The lithic samples generated by this limited testing were, in all cases, sufficient for evaluating each site's research potential and NRHP eligibility. While the goal of determining site eligibility was met, it was not a goal of the testing program to obtain large artifact assemblages for interpretive purposes. With the exception of the sample from 41BL155, Subarea B (a site with an unusually high artifact density), the small samples recovered have limited interpretive potential. The artifact samples recovered during this project (especially tools) are not large enough for statistical validity; therefore, some of the interpretations presented are extremely tenuous (see Chapter 8). It was hoped that this detailed lithic analysis might reveal some meaningful and interesting patterns relating to human behavior. Unfortunately, it must be conceded that this level of analysis stretches the interpretive limits of the artifact samples. The codification of numerous lithic attributes generated extraneous data sets that were neither statistically reliable nor particularly representative of the sites or time periods being sampled. Detailed lithic analyses are warranted for intensive testing or data recovery work when material culture samples are larger and more representative, but such efforts have proven to be fruitless in this case. Since the current site testing strategy satisfies management goals but falls short of meeting material culture sampling and analysis goals, this detailed level of lithic analysis is not warranted in future NRHP testing of prehistoric sites at Fort Hood.

In contrast to the rather limited interpretive results supported by the lithic analysis, flotation of cultural sediments and feature fill provided abundant macrobotanical remains useful for interpreting human behavior. The macrobotanical analysis by Dering (see Appendix D) indicates that abundant and diverse assemblages are preserved in some settings; the study also demonstrates that identification of these remains can provide meaningful interpretive data even if only one or two samples from a single site are processed. Consequently, given the limited nature of site testing and the generally inadequate lithic sample sizes, future investigations would benefit by concentrating more on flotation samples and less on flake attributes. For example, a detailed attribute analysis of 1,307 flakes from six Leon River sites led to no substantive behavioral interpretations, but the macrobotanical analysis of remains recovered from only 5 of the 27 flotation samples from these same sites provides a rather interesting list of plants that were burned as fuel and probably eaten as food.

Rockshelters and Human Remains

Rockshelters have long been recognized as one of the most sensitive types of cultural resources at Fort Hood and throughout Central Texas, mainly because they are so vulnerable to damage and destruction by vandalism. Evidence of this was observed as early at 1935, when Frank Watt (1936:5–7) recorded numerous vandalized rockshelters in Bell County and excavated most of the large Aycock Shelter (Kell Branch Shelter No. 1). Even then, the "extensive digging for artifacts by nearby collectors" was perceived as a serious problem (Watt 1936:5). Before the Central Texas Archeological Society began the 1935–1936 excavations at Aycock Shelter, Watt (1936:7) noted that several human burials had been destroyed by relic collectors. At least three more burials there were destroyed by collectors during the three months that the society's excavations were being conducted.

Because they are in danger from actions other than normal military activities, managing rockshelters as archeological resources under the National Historic Preservation Act (NHPA) is an especially challenging problem at Fort Hood. The problem of rockshelter vandalism is complex, but one fact is clear. It is the human burials contained in rockshelters, or, more specifically, the grave offerings associated with these human burials, that are the primary incentive for pothunters.

A brief look at some old and new archeological reports hints at the longevity and extent of vandalism of rockshelters and human burials in the Fort Hood area. In a 1936 article entitled

"Destructive Activities of Unscientific Explorers in Archeological States," University of Texas anthropologist Dr. J. E. Pearce (1936:46) lamented the "extensive and outrageous" destruction of Central Texas burned rock middens and rockshelters. Noting the extent of vandalism of "numerous large rock shelters and caves in the rocky canyons of the Edwards Plateau, in western McLennan, Coryell, and Bosque counties," he commented that "these caves and shelters by the score have been turned inside out." It was clear to Pearce that shelters usually contained burials and that the burials were the targets of the pothunters. Regarding rockshelters, he stated that their

> floors have been dug up and the graves rifled merely for the flint points and the occasional shell bead found with the dead. The skeletons have been, in many places, simply thrown down the bluff and so scattered and broken as to amount to obliteration: thus all chance of ever studying them and tracing the racial movements amount the early population have been destroyed forever [Pearce 1936].

Since the 1930s, the destructive activities of relic collectors in Central Texas have only intensified. The status of the rockshelter vandalism problem at Fort Hood was recently summarized by Abbott and Trierweiler (1995a:674), who stated:

> In our opinion, the rate of shelter vandalism is far outstripping the pace of their effective management through the Section 106 compliance process. Like the burned rock features at Fort Hood, shelters represent a race between archeologists and vandals, and at this point, the archeologists are losing. We therefore recommend that management of NRHP-eligible shelters be accelerated to include data recovery investigations. This urgency should be matched with increased in military education and access control.

Rockshelters all over the installation have suffered tremendously from vandalism, and recent archeological investigations substantiate the bold statement above. Using 1994 data tabulated on 897 subareas at 571 sites on Fort Hood by Mariah (Trierweiler, ed. 1994:Appendix F), there are 117 subareas comprised of rockshelters (note that this number does not represent the actual number of rockshelters because some subareas contain multiple shelters). Forty-three percent (n = 50) of the 117 rockshelter subareas have evidence of vandalized deposits, and 14 percent (n = 16) of these subareas have had more than one-half of their rockshelter deposits destroyed by pothunting activities.

Perhaps a more accurate reflection on the rate of rockshelter vandalism may be derived from archeological site testing data. Of the 37 rockshelters that Mariah tested in 1994–1995 (Trierweiler 1996:Table 10.1), individual site descriptions indicate that 32 percent (n = 12) had vandalized deposits. Of the 15 shelters (at 9 sites) tested during FY 1995 and reported herein, none were damaged by regular Army training activities, but 47 percent (n = 7) showed evidence of vandalism (Shelter A at 41BL69, 41BL181, Shelters B and C at 41BL579, 41BL667, 41BL827, and Shelter A at 41CV944). It is estimated that more than 90 percent of the cultural deposits in four of these shelters have been destroyed (Shelter A at 41BL69, 41BL181, 41BL667, and Shelter A at 41CV944). If these samples are representative, it may be expected that between 32 and 47 percent of the rockshelters on Fort Hood have been vandalized to some extent, while around 27 percent have deposits that are virtually destroyed.

At least two of the shelters reported here (41BL181 and Shelter A at 41CV944) show evidence of recent vandalism that occurred since they were investigated in 1992. At 41BL181, for example, the deposits were estimated to be 50 percent disturbed in 1984, and the condition was the same when the site was revisited by Mariah in September 1992. When the shelter was tested three years later in September 1995, almost all of the remaining deposits had been destroyed (see Chapter 5). In addition, NRHP-eligible rockshelter 41CV901 was relatively intact when it was tested in February 1995. When revisited about three weeks later, the shelter was found to have 50 percent or more of its cultural deposits destroyed by pothunters, although an intact burial may have been fortuitously missed (Trierweiler 1996:393–397).

Avoidance, monitoring, and protection are

variable and cost-effective strategies for protecting some types of cultural resources on federally owned lands, but these options are less attractive for rockshelters of Fort Hood. Controlling archeological vandalism at sensitive sites in remote areas has proven to be nearly impossible all over the United States, and the Fort Hood area, with its long and well-documented history of rockshelter vandalism, is no exception. The Fort Hood Cultural Resources Management (CRM) Program is attempting to curb vandalism by implementing a study to test the effectiveness of electronic surveillance equipment and constant monitoring. Under this pilot study, intrusion detection devices will be installed in three NRHP-eligible rockshelters (note that Shelter B at 41BL69 is a worth candidate), but it will be many years before the effectiveness of this type of surveillance and monitoring can be adequately evaluated. Even if the technique proves effective, it will be extremely expensive, both in terms of equipment and labor costs for continuous maintenance and monitoring, and there are many rockshelters at Fort Hood that warrant such protection. In the meantime, pothunting activities are still occurring regularly.

It is unrealistic to expect that sufficient resources will be available to provide adequate long-term protection of all NRHP-eligible rockshelters on Fort Hood. Because in situ preservation is not likely to be cost effective[1], we recommend that mitigation through comprehensive archeological data recovery (i.e., excavation of judiciously selected cultural deposits at a sample of shelters) is the most viable and cost-effective means of dealing with the NRHP-eligible rockshelters at Fort Hood.

In addition to managing rockshelters as archeological resources under the NHPA, the Fort Hood CRM Program is caught in a dilemma with regard to the Native American Graves Repatriation and Protection Act (NAGPRA) and protection of Native American burials contained in rockshelters. Human burials are very common in rockshelters, which were used as cemeteries as early as Late Archaic times. Burials attract pothunters, who dig rockshelters searching for "grave goods" to collect and sell. Untold numbers of Native American burials have already been destroyed at Fort Hood. The testing of Shelter A at 41BL69 in FY 1995 (see Chapter 5) provides but one example. This shelter probably contained dozens of burials at one time but now houses only a thick masses of disturbed sediments and scattered, broken human bones left behind by pothunters. The extent of destruction at this site can only be viewed with sadness by Native Americans and archeologists alike.

Two management problems arise with respect to human remains in rockshelters. The first problem is that Fort Hood must manage every rockshelter that contains human remains, regardless of its NRHP eligibility. Fort Hood must manage rockshelters from two perspectives that are not always compatible: as archeological data sets under the NHPA and as Native American cemeteries under NAGPRA. For example, although Shelter A at 41BL69 contains no intact deposits (see Chapter 5) and is recommended as ineligible for listing in the NRHP, the disturbed deposits there contain abundant human remains that are significant to the Native American community. Thus, although it has a low archeological research potential and is not significant with respect to National Register criteria, the shelter must still be managed under NAGPRA.

A second problem arises when archeologists excavate rockshelters and encounter human remains. If Fort Hood embarks on a rockshelter data recovery program under Section 106 of the NHPA, it will involve excavating parts or all of numerous rockshelters to provide samples of the archeological data they contain. Human burials are known to exist in many of the NRHP-eligible shelters, and more burials will probably be encountered in other shelters. Under NAGRPA, excavations will cease when human remains are encountered and consultation with Native American tribes must occur. Because no agreements with tribal groups exist, this effectively ends the archeological investigation.

As the situation currently exists, the Tonkawa tribe is considered to be related to and, with respect to NAGPRA, speaks on behalf of the Native American remains found in rockshelters on Fort Hood. The Tonkawa would prefer that human burials in rockshelters not be disturbed at all, and they do not want

[1]One possible preservation technique is covering rockshelter deposits with reinforced concrete, thereby making them inaccessible to pothunters. This technique has both good and bad points, but should be given some consideration.

archeologists digging them up solely for research purposes. It there were a viable means of protecting burials in Fort Hood rockshelters from future vandalism, this simple solution would be logical for all concerned. However, the federal government has neither the time nor the resources to adequately protect rockshelters where intact human burials are known, much less to protect all of the other shelters where burials may exist.

A wide variety of options and opinions must be considered when making decisions whether to preserve or mitigate. While Fort Hood protects historic Anglo-American cemeteries on-post by fencing them and putting up warning signs, such efforts at prehistoric sites would only serve as a beacon for pothunters. Despite serious attempts by archeologists to stop vandalism of Native American burials, the problem is far from resolved. It is one thing to pass laws protecting Native American graves; enforcement has proven to be the difficult task. If in situ preservation of National Register–eligible rockshelters is not a viable alternative under the NHPA, as mentioned above, then in situ preservation of human burials in rockshelters is not a realistic long-term solution under NAGPRA either.

The situation can be summarized as follows: pothunters are not going to stop digging for artifacts, and the federal government faces the nearly impossible job of protecting the NRHP-eligible rockshelters and human burials form vandalism. While the Native American and archeological communities seem reluctant to find a compromise between their various religious, scientific, and legal perspectives, the pothunters are diligently at work destroying rockshelters and graves. In this situation many groups lose, including Native peoples whose ancestors' remains are desecrates; the archeological community and general public whose hopes of understanding prehistory are greatly diminished by the loss of irreplaceable evidence; and the federal government, which gets blamed for not being able to protect its cultural resources. As long as the situation remains unchanged, there is only one clear winner: the pothunters.

We feel that the urgency of the situation is clear and that the time has come to begin serious negotiations among Native Americans, archeologists, and Fort Hood officials. All interested parties must work quickly if we are to stem the tide of destruction and save important archeological data and Native Americans burials at Fort Hood from disappearing under the pothunter's spade.

Leon River Sites

All of the NRHP-eligible sites located in the Leon River valley appear to be largely undisturbed by Army activities, and evidence of earthmoving by large tracked vehicles is noticeably absent. Because these sites contain cultural deposits that are buried at least 0.5 to 1 m deep, they appear to be relatively safe from most activities involving only surficial or shallow disturbances. While extensive disturbances were observed on upper terraces overlooking the Leon River valley, perhaps maneuvers involving large tracked vehicles are less likely to occur on the lower terraces, in close proximity to the edge of the river. Since the NRHP-eligible Leon River sites contain buried deposits located immediately adjacent to the river channel, they may be less endangered from typical Army activities, relatively speaking, than are many other open sites. There is no evidence that archeological vandalism is a factor at any of the NRHP-eligible sites along the Leon River. Consequently, the Leon River sites appear to be less threatened than many other types of sites at Fort Hood, and long-term preservation appears to be a viable cultural resources management option if there are no significant changes in Army activities in the northern portion of the base.

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APPENDIX A: Summary and Evaluation of Radiocarbon Dates

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Twenty-five radiocarbon samples from feature and nonfeature contexts at 11 archeological sites were analyzed by Beta Analytic, Inc., of Miami, Florida. The sample materials, proveniences, resulting radiocarbon ages, and tree-ring calibrated calendrical dates are shown in Table 72.

The dated samples consist of 21 charcoal (or charred wood) samples, 1 bulk sediment sample, and 3 terrestrial snails. Beta Analytic processed the samples using the following standard pretreatment techniques for various materials: acid/alkali/acid for charred materials; acid wash for sediment; and acid etch for snail shells. Five samples (4 charcoal and 1 sediment) were analyzed using the conventional radiometric technique. The sediment sample required special handling due to its low carbon content, and three of the charcoal samples required extended counting time due to small sample sizes. Because of their small sizes, the other 17 charcoal and 3 snail samples were submitted by Beta Analytic to one of their collaborating laboratories, Lawrence Livermore National Laboratory (Berkeley, California), for radiocarbon dating using the accelerator mass spectrometer technique.

The conventional radiocarbon ages (the $\delta^{13}C$-corrected ages) are reported in RCYBP, radiocarbon years before present (where the present is A.D. 1950). They were calculated using the Libby ^{14}C half life of 5,568 years. The $^{13}C/^{12}C$ ratios were calculated relative to the PDB-1 international standard, and RCYBP ages were normalized to –25 per mil. All of the radiocarbon ages are tree-ring calibrated using the bidecadal Dataset no. 1 (Kromer and Becker 1993; Pearson and Stuiver 1993; Stuiver and Pearson 1993) in the computer program CALIB 3.0. (Stuiver and Reimer 1993).

In general, the charcoal radiocarbon ages and calibrated dates correspond closely with archeological expectations based on stratigraphic and cultural contexts of the dated samples. The tree-ring calibrated charcoal dates are considered to be reliable age estimates for the cultural deposits from which the samples were obtained. The one exception is a charcoal sample from rockshelter 41BL581 that yielded an unexpectedly old radiocarbon age of 10,010 ± 60 B.P. (Beta-87636). Although the investigators anticipated the possibility that this sample might be older than most or all of the other samples, its great antiquity is somewhat surprising. Based on its well-documented stratigraphic context and close association with a chipped stone artifact, there is no reason to doubt the validity of this date or that it reflects the approximate age of a cultural event represented in the shelter's lower deposits (see Chapter 5). Consequently, cultural occupation of the shelter did occur in late Pleistocene times and well within the accepted temporal parameters of the Paleoindian cultural period. Perceptions of precisely when the occupation occurred will vary, depending largely upon which method one chooses to calibrate the radiocarbon age (Table 73). Calibrating according to CALIB 3.0 or the older calibration formula of Stuiver et al. (1986:971) yields dates that are considerably older than the conventional age (by 1,000 years or more). The former method yields the oldest calibrated date and pushes the beginning of the date range back to 9708 B.C. (11,658 B.P.). Results undoubtedly will be different if other calibration methods are employed; also, any tree-ring calibrations are likely to push the date back in time. Both of the calibrated dates shown in Table 73 fall into the generally accepted time frame for the Clovis culture at approximately 11,200–10,900 B.P. (Haynes 1992, as cited by Collins 1995). Unfortunately, the inference of a possible Clovis-age occupation is extremely tenuous based on a single radiocarbon date and a lack of culturally or temporally diagnostic artifacts.

The three radiocarbon dates obtained on snail shells represent a continuation of the land snail chronological studies begun by Mariah Associates in the early 1990s. For consistency, all of their studies have focused on a single genus, *Rabdotus* sp., that is abundant in the archeological deposits at Fort Hood and throughout Central Texas. Their intensive investigations of land snails have focused primarily on developing amino acid epimerization analysis into an independent dating method and using the epimer data to evaluate the integrity of archeological deposits (Abbott et al. 1995; Ellis and Goodfriend 1994). This technique analyzes the ratio of two specific amino acid epimers (i.e., D-alloisoleucine and L-isoleucine) found in the organic matrix of individual snail shells. The resulting data, called an A/I ratio, is a crude indicator of relative age because one form of epimer (the D-alloisoleucine) transforms into the other form (L-isoleucine) gradually through time. Their studies have involved analyzing large

Table 72. Results of radiocarbon dating

Lab no. (material)	Site (Analysis Unit)	Sample provenience	Corrected age B.P. ($\delta^{13}C$)[1]	Calibrated calendrical date 1-sigma range with (intercepts)[2]
Beta-87635* (Charcoal)	41BL155 (AU 1)	Feature 2 (40–50 cm)	2400 ± 60 (–22.7)	751 (407) 395 B.C.
Beta-87636* (Charcoal)	41BL581 (Shelter B)	Test Unit 1 (38–45 cm)	10,010 ± 60 (–26.3)	9708 (9361, 9359, 9260, 9227, 9168) 9059 B.C.
Beta-87637* (Charcoal)	41BL582 (Shelter A)	Feature 1 (30–40 cm)	2500 ± 60 (–27.0)	785 (760, 672, 665, 632, 592, 584, 560) 427 B.C.
Beta-87638* (Charcoal)	41BL827 (Shelter)	Test Unit 1 (20–30 cm)	710 ± 50 (–27.5)	A.D. 1279 (1290) 1303
Beta-87639 (Charcoal)	41BL827 (Talus)	Feature 2 (40–50 cm)	730 ± 70 (–27.6)	A.D. 1251 (1286) 1303
Beta-87642* (Charcoal)	41CV722 (AU 1)	Feature 4 (20–30 cm)	580 ± 60 (–25.5)	A.D. 1307 (1400) 1421
Beta-87640 (Charcoal)	41CV722 (AU 2)	Feature 1 (39–40 cm)	1680 ± 100 (–28.0)	A.D. 248 (397) 532
Beta-87641* (Charcoal)	41CV722 (AU 2)	Feature 3 (48 cm)	1460 ± 60 (–26.3)	A.D. 552 (619) 654
Beta-87659* (Charcoal)	41CV722 (AU 2)	Test Unit 6 (100 cm)	1570 ± 60 (–26.7)	A.D. 423 (535) 592
Beta-87658 (Charcoal)	41CV722 (AU 3)	Test Unit 6 (47 cm)	320 ± 70 (–26.9)	A.D. 1477 (1530, 1537, 1635) 1657
Beta-87643 (Charcoal)	41CV1478 (AU 2)	Test Unit 1 (190–200 cm)	780 ± 70 (–26.2)	A.D. 1217 (1275) 1290
Beta-87644* (Charcoal)	41CV1478 (AU 3)	Feature 1 (165–180 cm)	1830 ± 60 (–26.2)	A.D. 124 (222) 315
Beta-87645* (Charcoal)	41CV1479 (AU 2)	Test Unit 2 (190–200 cm)	940 ± 60 (–26.8)	A.D. 1022 (1046, 1097, 1115, 1144, 1153) 1177
Beta-87646* (Charcoal)	41CV1479 (AU 2)	Feature 1 (210 cm)	870 ± 60 (–27.7)	A.D. 1052 (1195) 1248
Beta-87647 (Sediment)	41CV1479 (AU 2)	Zone 6 in BHT 2 (176–186 cm)	1160 ± 40 (–20.2)	A.D. 870 (888) 962
Beta-87648 (Charcoal)	41CV1480 (AU 1)	Feature 1 (160–170 cm)	420 ± 70 (–28.1)	A.D. 1433 (1454) 1621
Beta-87649* (Charcoal)	41CV1482 (AU 2)	Feature 1 (104 cm)	1060 ± 60 (–26.6)	A.D. 898 (997) 1023
Beta-87650* (Charcoal)	41CV1482 (AU 3)	Feature 3 (126–133 cm)	1880 ± 70 (–25.0)	A.D. 71 (130) 235
Beta-87651* (Charcoal)	41CV1482 (AU 3)	Feature 4 (182–187 cm)	2140 ± 70 (–28.5)	348 (173) 49 B.C.
Beta-87652* (Snail Shell)	41CV1482 (AU 2)	Feature 1 (100–103 cm)	1340 ± 60 (–9.9)	A.D. 654 (671) 767
Beta-87653* (Snail Shell)	41CV1482 (AU 3)	Feature 3 (126–133 cm)	2040 ± 70 (–9.7)	114 (36) B.C. A.D. 60
Beta-87654* (Snail Shell)	41CV1482 (AU 3)	Feature 4 (183–187 cm)	2970 ± 60 (–9.5)	1265 (1196, 1181, 1165, 1141, 1139) 1062 B.C.
Beta-87655* (Charcoal)	41CV1549 (AU 2)	Feature 2 (86–95 cm)	1560 ± 60 (–27.0)	A.D. 427 (530) 596
Beta-87656* (Charcoal)	41CV1549 (AU 2)	Feature 3 (150–162 cm)	2440 ± 60 (–27.0)	761 (511, 435, 428) 403 B.C.
Beta-87657* (Charcoal)	41CV1549 (AU 1)	Feature 4 (190–200 cm)	1180 ± 70 (–27.9)	A.D. 779 (883) 967

[1] Corrected ages and $\delta^{13}C$ values by Beta Analytic, Inc.
[2] Calibrations done using the 20-year record in CALIB 3.0. The 1-sigma ranges and all intercepts are shown.
* AMS date from Lawrence Livermore Laboratory.

Table 73. Comparison of conventional radiocarbon age ($\delta^{13}C$-corrected) and tree ring calibrations for the dated charcoal sample (Beta-87636) from 41BL581

	Age B.P., 1-sigma Range	Date B.C., 1-sigma Range
Conventional ^{14}C Age	10,070–9,950	8120–8000
CALIB 3.0 (Stuiver and Reimer 1993)	11,658–11,009	9708–9059
Formula of Stuiver et al. (1986:971)*	11,040–10,920	9099–8970

*Calibrated age = 1.05 (corrected age) + 470

numbers of snails in an attempt to establish the rate at which this transformation, or epimerization, occurs. This is done by comparing A/I ratios for groups of snails with AMS radiocarbon dates on the snails themselves and/or with radiocarbon-dated organic remains from the same archeological contexts or strata. Their results are quite consistent and encouraging, although much background work remains to be done before A/I ratio analysis can stand on its own as a dating technique. Ellis and Goodfriend (1994:199–201) concluded that it is possible to directly date archeological deposits using A/I ratios on groups of snails from well-defined contexts (with some caveats regarding burned snails), but the key is calibrating the A/I ratio data relative to corresponding radiocarbon assays. Beyond dating, A/I ratio analysis may be used to address research questions relating to integrity of deposits, rates of deposition, and other contextual problems.

Extending their study, Ellis and Goodfriend (1994:184, 196, 201, Table 7.2) submitted 10 snail shells (*Rabdotus dealbatus*) for AMS radiocarbon dating and A/I ratio analysis to determine the precision of radiometric dating of snail shells. Radiocarbon dates on snails have traditionally met with skepticism because snails can ingest ancient carbonates (i.e., dead carbon) during their lives and incorporate old carbon into their shells. Recent studies have shown that the amount of contamination due to ingestion of dead carbon varies considerably from species to species, depending upon the region or area in which they lived (Goodfriend and Stipp 1983). Consequently, the "dead carbon factor" would be so great and variable for some species in some areas as to render them useless for radiocarbon dating. In contrast, the dead carbon factor for other species in other areas may be relatively low and/or quite predictable. This is a particularly relevant problem in Central Texas because the limestone-rich soils in which the snails live are the major source of the dead carbon that they ingest. If the intake of dead carbon can be shown to be minimal or relatively consistent within a single genus or species, then the amount of dead carbon influence can be measured to adjust the resulting radiocarbon ages. By dating enough shells in conjunction with other datable organics, it is theoretically possible to define the amount of dead carbon influence, or the radiocarbon "age anomaly," that must be subtracted from snail shell dates to calibrate them relative to charcoal radiocarbon ages. Based on their research, Ellis and Goodfriend (1994:196) concluded that (1) radiocarbon dating of *Rabdotus* can provide reliable dates because the amount of the radiocarbon age anomaly is relatively low for the genus, and (2) there is still some uncertainty regarding variability in the dead carbon factor between individual shells of the same species.

During a subsequent phase of work, Mariah submitted an additional five *Rabdotus* snail shells for amino acid racemization analysis and radiocarbon dating (Abbott et al. 1995; Abbott and Trierweiler 1995:Appendix D). They also radiocarbon dated the shells of two *Rabdotus* that were living when they were collected by the Smithsonian Institution before the advent of the atomic bomb (thereby eliminating any potential bomb-related contamination). The two modern shells produced AMS radiocarbon dates of 640 ± 50 B.P. and 690 ± 60 B.P. Abbott et al. (1995: 803, 806–808) suggested that this ca. 650-year radiocarbon age anomaly for the genus *Rabdotus* may reflect a consistent amount of dead carbon influence. If so, this age anomaly should be useful as a *Rabdotus* shell radiocarbon age correction factor. Abbott and Trierweiler (1995:676) concluded that "additional AMS ages of snails should be pursued to better define the calibration curve [for A/I ratio dating] and to assess the variability in the radiocarbon age anomaly from individual snails."

Following this line of research, Prewitt and

Associates submitted three paired sets of charcoal and unburned *Rabdotus* shells for radiocarbon dating (Table 74, Figure 89). Each pair of samples was collected from a different cultural feature within a distinct paleosol at 41CV1482 (see Chapter 6). This paleosol was observed in all of the other sites located in alluvial settings along the Leon River (i.e., 41CV1487, 41CV1482, 41CV1480, 41CV1479, and 41CV1478) and the overwhelming majority of the cultural materials from these sites was recovered from this paleosol. At 41CV1482, the 112–160-cm-thick paleosol is located at the top of the West Range alluvium, immediately below the Ford alluvium. It is generally found at ca. 65 to 220 cm below the surface.

The first pair of samples consists of charcoal and a single shell recovered from a hearth (Feature 1) located near the top of the paleosol, at 96–109 cm in Test Unit 1. The second pair of samples consists of charcoal and a single shell recovered from an intact baking pit (Feature 3) in the middle of the paleosol, at 126–133 cm in Test Unit 3. The final pair of samples consists of charcoal and a single snail shell from a burned rock concentration (Feature 4) encountered at 182–189 cm in Test Unit 2, near the bottom of the paleosol.

The three charcoal radiocarbon ages are internally consistent, ranging from the lower paleosol age of 2140 B.P. to the upper paleosol age of 1060 B.P. If these dates accurately reflect the rate of deposition, this paleosol represents a slowly aggrading depositional environment, with ca. 1.5 m of sediment accumulating over a period of approximately 1,000 years. The snail shell ages also are internally consistent, but they indicate a greater total span of time (ca. 1,600 years) and are consistently older than their charcoal counterparts (by 280, 160, and 830 years, from top to bottom, respectively). When the 650-year dead carbon age anomaly correction is applied, the three snail shell ages are still stratigraphically consistent, but the two upper paleosol ages become younger than their charcoal matches while the lower paleosol age is much closer to the corresponding charcoal age. It is impossible to state whether the conventional snail shell radiocarbon ages are more or less accurate than their dead carbon corrected versions because the precise relationships between the charcoal and snail shell samples are not known. However, since the sample pairs were all taken from presumably intact burned rock features, the absence of burning indicates that the snails came along some time after the features were burned. If this assumption is correct, then the true ages of the shells should be the same as or younger (but not older) than the radiocarbon ages of the corresponding feature-associated charcoal samples. Consequently, it would appear that the conventional snail shell radiocarbon ages are indeed too old and that the dead carbon correction factor puts them more in line with expectations. Thus, the three pairs of radiocarbon-dated samples from 41CV1482 generally support the suggestion of Abbott et al. (1995:803, 806–808) that there is a predictable radiocarbon age anomaly for correcting radiocarbon assays on *Rabdotus* shells.

Table 74. Comparison of conventional (δ^{13}C-corrected) AMS radiocarbon ages for paired samples of charcoal and snail shells from 41CV1482

Feature association, context	Dated material/ sample No.	Conventional ^{14}C age (B.P.)	Corrected snail shell age[1] (B.P.)	Calibrated date[2]
Feature 1, upper paleosol	Charcoal/Beta-87649	1060 ± 60	–	A.D. 898 (997) 1023
	Snail/Beta-87652	1340 ± 60	690 ± 60	A.D. 1281 (1295) 1386
Feature 3, middle paleosol	Charcoal/Beta-87650	1880 ± 70	–	A.D. 71 (130) 235
	Snail/Beta-87653	2040 ± 70	1390 ± 70	A.D. 617 (657) 681
Feature 4 lower paleosol	Charcoal/Beta-87651	2140 ± 70	–	348 (173) 49 B.C.
	Snail/Beta-87654	2970 ± 60	2320 ± 60	403 (391) 368 B.C.

[1]"Corrected" ages are derived from the conventional ^{14}C age due to the dead carbon factor described by Abbott et al. (1995:803–808).

[2]"Corrected" snail shell ages were calibrated using CALIB 3.0, and the resulting calibrated dates are different from those presented in Table 73.

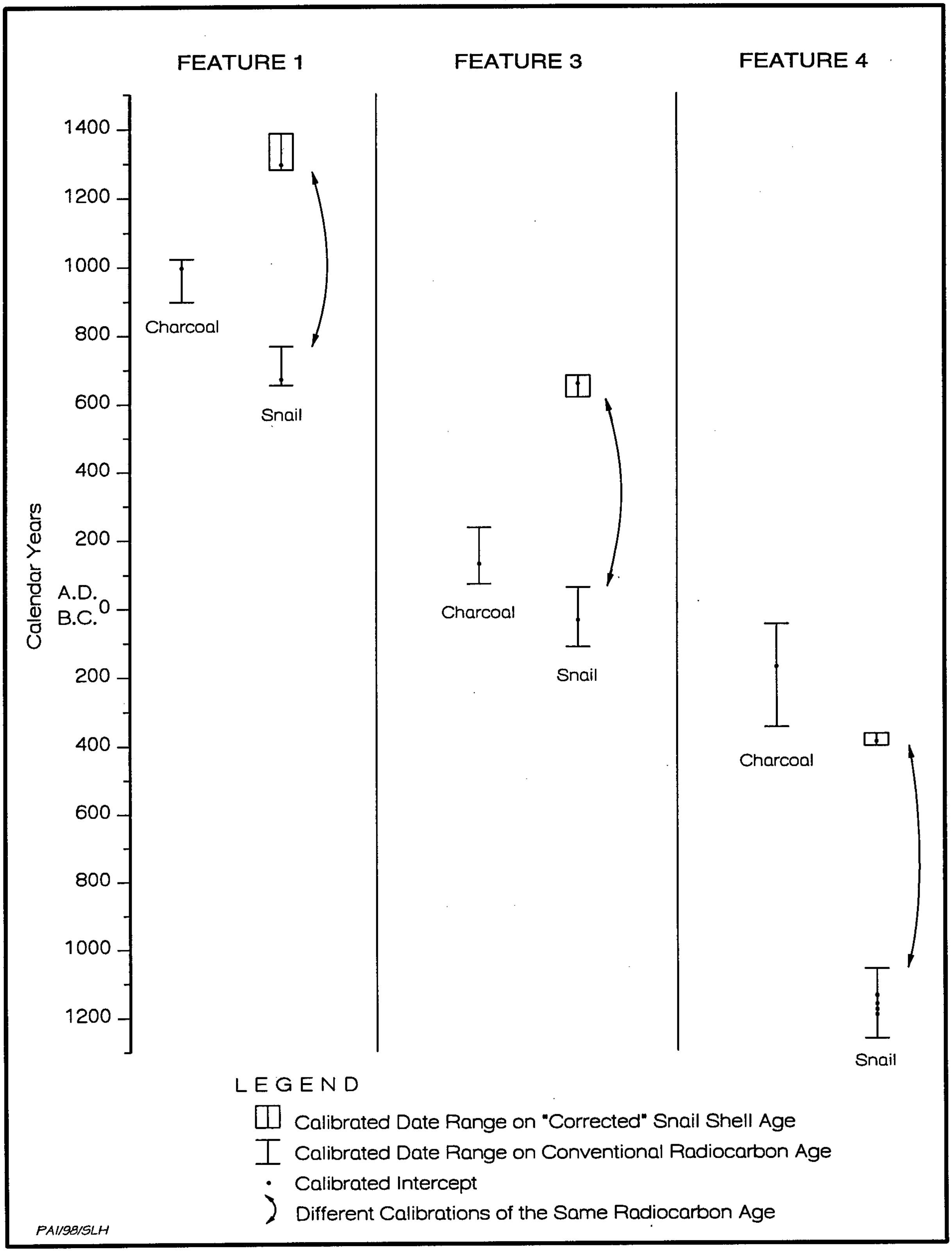

Figure 89. Graph of calibrated radiocarbon dates on paired samples of charcoal and snails from features at 41CV1482. Conventional radiocarbon age tree-ring calibrations are from Table 72. Tree ring calibrations of "corrected snail shell ages" are from Table 74.

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APPENDIX B: Geologic Profile Descriptions

Karl W. Kibler

Backhoe trench and test unit profiles are described and classified according to the procedures and criteria presented by Buol et al. (1980:21–43), Birkeland (1984), and Bettis (1984). The profile descriptions use the neutral term "zone" in order to describe pedogenic and stratigraphic changes within the profile under a single term. The color (Munsell Soil Color Chart) and consistency (loose, very friable, friable, firm, very firm, and extremely firm) of a zone or sediment are recorded from a moist condition.

Field definitions of sediment texture consist of (1) sand (loose, single grained, moist cast will crumble); (2) sandy loam (mostly sand with enough silt and clay to be somewhat coherent, individual sand grains are visible, moist cast bears careful handling); (3) loam (even mixture of sand, silt, and clay, gritty yet fairly smooth and slightly plastic, moist cast handles freely); (4) silt loam (predominantly silt with small amounts of fine sand and clay, moist cast bears heavy handling but will not ribbon); (5) clay loam (predominantly clay with small amounts of fine sand and silt, moist ribbon breaks easily, moist cast bears heavy handling, slightly plastic, kneaded heavy compact mass will not crumble); and (6) clay (very plastic and sticky when wet, flexible ribbon). The terms sandy clay, sandy clay loam, loamy sand, silty clay, silty clay loam, and silt are used when the texture of a zone could not be confidently placed into one of the above categories. The textural name is prefaced by the term "gravelly" if 20 to 50 percent of the sediment by volume is of gravel size (2–76 mm) or "very gravelly" if more than 50 percent of the sediment is of gravel size. The same proportions apply to coarser material such as cobbles (76–256 mm) and boulders (>256 mm). In some instances the textural classification schemes of Folk (1954, 1974), which describe textures based on the ratios of gravel, sand, and mud, were more appropriate to describe textures and therefore were utilized.

The structure or soil aggregation of a zone or horizon is described by grade, size, and type. The grade is shown as weak, moderate, or strong. The size of the peds is shown as fine, medium, or coarse, depending on ped morphology or type. The type, referring to the shape of the peds, is identified as blocky (subangular and angular), platy, prismatic, columnar, or granular. Soil horizons not containing these characteristics are considered structureless. Final soil horizon classifications were made based on the terminology and criteria presented by Birkeland (1984) and Bettis (1984).

In the absence of soil formation, the sedimentary structures of a zone are presented. Types of sedimentary structures include, but are not limited to, planar laminations, graded beds, cross-stratifications, trough cross-stratifications, ripples, climbing ripples, and massive structures.

Mottles are described by color, abundance, contrast, and size. Abundance is shown as few (less than 2 percent), common (2–20 percent), and many (greater than 20 percent), while contrast is described as faint, distinct, or prominent. Size ranges are given as fine (<0.5 cm), medium (0.5–1.5 cm), or coarse (>1.5 cm). Terms pertaining to abundance are also used to describe the occurrence of inclusions or intrusive objects, such as charcoal or roots. The lower boundary of each zone or horizon is described in terms of distinctiveness as very abrupt (<0.1 cm), abrupt (0.1–2.5 cm), clear (2.5–6.4 cm), gradual (6.4–12.7 cm), or diffused (>12.7 cm). Topography is described as smooth, wavy, irregular, or broken.

BELL COUNTY SITES

Zone Depth (cm) Description

41BL69 Subarea B, Shelter A

Test Unit 2, west wall

Zone	Depth (cm)	Description
1	0–39 cm	Grayish brown (10YR 5/2) firm sandy clay loam, structureless, many roots and rootlets, common snail shells, few freshwater mussel shells, many granule- to pebble-sized spalls, abrupt, smooth lower boundary, C horizon.
2	39–96	Gray (10YR 5/1) firm sandy clay loam, structureless, many roots and rootlets, to 104 cm common snail shells, few freshwater mussel shells, many granule- to pebble-sized spalls, abrupt wavy to broken lower boundary, C2 horizon.
3	96 to	Densely packed angular, cobble- to boulder-sized clasts from the escarpment face, 104–124 cm many interstitial voids and very little fine-grained matrix, Cu horizon.
4	124–150+ cm	Very pale brown (10YR 7/3) firm sandy clay, structureless, few rootlets, many granule-sized spalls, lower boundary not observed, 2C horizon.

Test Unit 4, west wall

Zone	Depth (cm)	Description
1	0–25 cm	Grayish brown (10YR 5/2) friable sandy clay loam, structureless, few rootlets, many granule- to pebble-sized spalls, few pieces of charcoal, abrupt to clear wavy lower boundary, C horizon.
2	25–38 cm	Dark gray (10YR 4/1) firm sandy clay loam, structureless, many pieces of charcoal, few rootlets, common granule- to pebble-sized spalls, abrupt wavy lower boundary, C2 horizon.
3	38–49 cm	Light brownish gray (10YR 6/2) firm sandy clay, structureless, few pieces of charcoal, few granule-sized spalls, very abrupt wavy lower boundary, limestone bedrock at 49 cm, C3 horizon.

41BL155

Backhoe Trench 1, east wall

Zone	Depth (cm)	Description
1	0–46 cm	Very dark grayish brown (10YR 3/2) firm clay loam, moderate medium angular blocky structure, many roots and rootlets, few dispersed small limestone gravels, common organic materials, burned rock Feature 1, clear smooth lower boundary. Late Holocene alluvium, A horizon.
2	46–90 cm	Brown (10YR 5/3) firm silty clay loam, weak fine angular blocky structure, common medium distinct mottles (10YR 7/2), common roots and rootlets, few dispersed limestone gravels, few pieces of chert debitage, few organic materials, gradual smooth lower boundary. Late Holocene

Zone	Depth (cm)	Description
		alluvium, Bw horizon.
3	90–126+ cm	Grayish brown (10YR 5/2) very firm gravelly clay, moderate medium angular blocky structure, many coarse prominent mottles (10YR 5/1), few roots and rootlets, few $CaCO_3$ filaments, lower boundary not observed. Middle to late Holocene alluvium, C horizon.

<u>Backhoe Trench 3, east wall</u>

1	0–34 cm	Very dark gray (10YR 3/1) firm clay loam, moderate fine subangular blocky structure, common roots and rootlets, common organic materials, common lithic debitage, few dispersed limestone gravels, clear smooth lower boundary. Late Holocene alluvium, A horizon.
2	34–62 cm	Brown to dark brown (7.5YR 4/3) firm silty clay, moderate medium angular blocky structure, common roots and rootlets, few dispersed small limestone gravels, few pieces of chert debitage, clear smooth lower boundary. Late Holocene alluvium, Bw horizon.
3	62–97 cm	Brown (7.5YR 5/4) firm gravelly silty clay, moderate medium angular blocky structure, common faint fine mottles (10YR 6/3), few roots and rootlets, abrupt smooth to wavy lower boundary. Middle to late Holocene alluvium, C horizon.
4	97–111+ cm	Weathered limestone bedrock, Cr horizon.

41BL181

<u>Test Unit 2, north wall</u>

1	0–5 cm	Black (10YR 2/1) friable silty clay loam, structureless, many organic materials, many granule-sized spalls, few pebble-sized spalls, many roots and rootlets, abrupt smooth lower boundary, A horizon.
2	5–14 cm	Very dark grayish brown (10YR 3/2) firm clay loam, structureless, common roots and rootlets, many granule- to small pebble-sized spalls, abrupt wavy lower boundary, Bt horizon.
3	14+ cm	Limestone bedrock, R horizon.

<u>Test Unit 3, west wall</u>

1	0–10 cm	Black (10YR 2/1) friable very gravelly silty clay loam, structureless, many roots and rootlets, many organic materials, few snail shells, clear smooth lower boundary, A horizon.
2	10–22	Very dark grayish brown (10YR 3/2) firm very gravelly clay loam, structureless, to 61 cm few organic materials, many roots and rootlets, common snail shells, abrupt wavy lower boundary, Bt horizon.
3	22–61+ cm	Limestone bedrock, R horizon.

Zone	Depth (cm)	Description
41BL579 Subarea B, Shelter B		
Test Unit 3, north wall		
1	0–5 cm	Dark grayish brown (2.5Y 4/2) friable silt, structureless, few roots and rootlets, many small spalls, common pieces of charcoal, few pieces of culturally burned rock, thin zone of oxidized sediment present along the lower boundary (probable recent military campfire), abrupt smooth lower boundary, Cu horizon.
2	5–9 cm	Very pale brown (10YR 7/4) friable silt, structureless, common roots and rootlets, common small spalls; abrupt wavy to broken lower boundary; C horizon.
3	9–40 cm	Grayish brown (10YR 5/2) friable silt, structureless, common roots and rootlets, many granule-, pebble-, cobble-, and boulder-sized spalls, lower boundary not observed, Cr horizon.
41BL579 Subarea B, Shelter C		
Test Unit 1, east wall		
1	0–25 cm	Pale brown (10YR 6/3) friable silt, structureless, few distinct coarse mottles (5YR 7/2), many roots and rootlets, many spalls, abrupt smooth lower boundary, C horizon.
2	25–50 cm	Very pale brown (10YR 7/3) friable silt, structureless, few roots and rootlets, many granule-, pebble-, and cobble-sized spalls, very abrupt smooth lower boundary, limestone bedrock at 50 cm, C2 horizon.
Test Unit 2, west wall		
1	0–4 cm	Light yellowish brown (2.5Y 6/4) friable silt, structureless, few roots and rootlets, common small spalls, abrupt smooth lower boundary, Cu horizon.
2	4–24 cm	Pale yellow (2.5Y 7/3) friable silty clay loam, structureless, many distinct coarse mottles (2.5Y 7/6 and 10YR 7/1), few roots and rootlets, many small spalls, clear wavy lower boundary, C2 horizon.
3	24–40 cm	Light brownish gray (10YR 6/2) friable sandy clay, structureless, common distinct coarse mottles (2.5Y 7/6), few roots and rootlets, many small spalls, abrupt smooth lower boundary, limestone bedrock at 40 cm, C3 horizon.
41BL581 Subarea B, Shelter B		
Test Unit 1, west wall		
1	0–28 cm	Dark brown (10YR 3/3) friable silty clay, weak medium subangular blocky structure, many small spalls but few cobble-sized spalls, abrupt smooth to wavy lower boundary, A horizon.

Zone	Depth (cm)	Description
2	28–51 cm	Reddish brown (5YR 4/3) firm clay loam, weak fine subangular blocky structure, common pieces of charcoal, thin (2 cm thick) ash lens at 51 cm, many granule-, pebble-, cobble-, and boulder-sized spalls, abrupt wavy lower boundary, 2Bt horizon.
3	51–90+ cm	Brown to dark brown (7.5YR 4/4) friable silt, structureless, few roots and root casts, many granule-, pebble-, cobble-, and boulder-sized spalls many spalls are oxidized or reddened by an unknown agent(s), lower boundary not observed, 2C horizon.

41BL582 Subarea A, Shelter A

Test Unit 2, south wall

1	0–47 cm	Very dark grayish brown (10YR 3/2) friable silt, structureless, common roots and rootlets, common snail shells, one freshwater mussel shell fragment, many granule- to pebble-sized spalls, clear smooth lower boundary, A horizon.
2	47–59 cm	Grayish brown (10YR 5/2) friable silty clay, structureless, few roots and rootlets, many granule-, pebble-, and cobble-sized spalls, clear smooth lower boundary, B horizon.
3	59–85+ cm	Grayish brown (10YR 5/2) firm silty clay loam, weak fine subangular blocky structure, few roots and rootlets, few snail shells, many granule-, pebble-, and cobble-sized spalls but few boulder-sized spalls, lower boundary not observed, B2 horizon.

41BL582 Subarea A, Shelter B

Test Unit 1, north wall

1	0–21 cm	Black (10YR 2/1) friable silty clay loam, structureless, many roots and rootlets, many granule-, pebble-, and cobble-sized spalls, common organic materials, clear wavy lower boundary, A horizon.
2	21–33 cm	Dark brown (7.5YR 3/2) friable clay loam, structureless, common roots and rootlets, many granule-, pebble-, and cobble-sized spalls, clear wavy lower boundary, C horizon.
3	33–47 cm	Brown to dark brown (7.5YR 4/4) friable clay loam, structureless, few roots and rootlets, many granule- to pebble-sized spalls, abrupt smooth lower boundary, weathered limestone bedrock observed at 47 cm, C2 horizon.

41BL667

Test Unit 3, east wall

1	0–38 cm	Very dark gray (10YR 3/1) friable silty clay loam, structureless, few

Zone	Depth (cm)	Description
		roots and rootlets, few snail shells, common granule- to pebble-sized spalls, few charcoal flecks, clear to gradual smooth lower boundary, A horizon.
2	38–50 cm	Dark grayish brown (10YR 4/2) friable silty clay, structureless, many granule- to pebble-sized spalls, few cobble-sized spalls, few roots and rootlets, abrupt wavy lower boundary, limestone bedrock observed at 50 cm, C horizon.

Test Unit 4, west wall

1	0–30 cm	Very dark gray (10YR 3/1) firm gravelly clay, moderate coarse granular structure, few cobble-sized limestone clasts, common roots and rootlets, clear smooth to broken lower boundary, A horizon.
2	30–45 cm	Very dark grayish brown (10YR 3/2) firm gravelly clay loam, moderate coarse granular structure, few roots and rootlets, few cobble-sized limestone clasts, clear smooth lower boundary, Bw horizon.
3	45–70+ cm	Yellowish brown (10YR 5/4) firm gravelly clay loam, moderate coarse granular structure, few roots and rootlets, lower boundary not observed, 2C horizon.

41BL816

Backhoe Trench 1, north wall

1	0–46 cm	Very dark gray (10YR 3/1) firm very gravelly clay loam, weak fine subangular blocky structure, many roots and rootlets, common organic materials, clear smooth lower boundary. Holocene colluvium, A horizon.
2	46–66 cm	Very dark grayish brown (10YR 3/2) firm silty clay loam, weak to moderate fine subangular blocky structure, common roots and rootlets, few dispersed small limestone gravels, abrupt smooth lower boundary. Holocene colluvium, C horizon.
3	66–83+ cm	Weathered limestone bedrock, Cr horizon.

41BL827

Test Unit 1, south wall

1	0–14 cm	Very dark grayish brown (10YR 3/2) friable silty clay loam, structureless, many roots and rootlets, common spalls, common organic materials, abrupt smooth lower boundary, A horizon.
2	14–51 cm	Very dark grayish brown (10YR 3/2) friable clay loam, structureless, many spalls, common roots and rootlets, few calcite crystals, abrupt wavy lower boundary, AC horizon.

Zone	Depth (cm)	Description
3	51–62 cm	Brown (10YR 5/3) friable silty clay loam, structureless, few roots and rootlets, common small spalls, very abrupt wavy lower boundary, limestone bedrock observed at 62 cm, C horizon.

Test Unit 2, west wall

1	0–7 cm	Black (10YR 2/1) loose gravelly silt, structureless, many organic materials, many roots and rootlets, clear smooth lower boundary, OA horizon.
2	7–26 cm	Very dark gray (10YR 3/1) friable very gravelly clay loam, structureless, common roots and rootlets, few snail shells, abrupt smooth lower boundary, A horizon.
3	26–51 cm	Dark grayish brown (10YR 4/2) friable silty clay loam, structureless, common roots and rootlets, few dispersed granule-sized limestone gravels, abrupt smooth lower boundary, C horizon.
4	51–60+ cm	Grayish brown (10YR 5/2) friable silty clay, structureless, few rootlets, few dispersed limestone gravels, lower boundary not observed, 2Cr horizon.

Test Unit 3, south wall

1	0–27 cm	Very dark grayish brown (10YR 3/2) friable clay loam, structureless, common roots and rootlets, common small spalls, few pieces of chert debitage, few snail shells, abrupt wavy lower boundary, A horizon.
2	27–54 cm	Very dark gray (10YR 3/1) friable silt, structureless, many roots and rootlets, many spalls (larger in size than in Zone 1), few snail shells, abrupt wavy lower boundary, C horizon.
3	54–90 cm	Very dark gray (10YR 3/1) friable clay loam, structureless, few roots and rootlets, many spalls, very abrupt wavy lower boundary, limestone bedrock at 90 cm, C2 horizon.

CORYELL COUNTY SITES

41CV722

Test Unit 1, east wall

1	0–24 cm	Very dark gray (10YR 3/1) firm gravelly clay, moderate medium angular blocky structure, common roots and rootlets, gradual smooth lower boundary, A horizon.
2	24–57 cm	Black (5YR 2.5/1) firm clay, moderate medium subangular blocky structure, common roots and rootlets, few dispersed limestone gravels, few pieces of chert debitage and freshwater mussel shells, clear smooth lower boundary, AC horizon.

Zone	Depth (cm)	Description
3	57–70+ cm	Very dark gray (10YR 3/1) firm very gravelly clay loam, moderate fine subangular blocky structure, few roots and rootlets, lower boundary not observed, C horizon.

Test Unit 5, north wall

1	0–33 cm	Dark grayish brown (10YR 4/2) firm gravelly clay loam, moderate medium subangular blocky structure, few snail shells, common roots and rootlets, common organic materials, clear smooth lower boundary, A horizon.
2	33–47 cm	Brown (10YR 5/3) firm gravelly clay loam, moderate fine angular blocky structure, few roots and rootlets, abrupt smooth lower boundary, limestone bedrock at 47 cm, Bw horizon.

Test Unit 6, west wall

1	0–31 cm	Very dark grayish brown (10YR 3/2) firm very gravelly clay loam, moderate fine subangular blocky structure, common roots and rootlets, common organic materials, few pieces of charcoal, few pedotubules, clear smooth lower boundary, A horizon.
2	31–38 cm	Very dark grayish brown (10YR 3/2) friable very gravelly sandy clay loam, structureless, few roots and rootlets, abrupt smooth lower boundary, C horizon.
3	38–46 cm	Very dark gray (10YR 3/1) firm clay loam, moderate fine subangular blocky structure, few dispersed small limestone gravels, common rootlets, many $CaCO_3$ filaments, common pieces of charcoal, abrupt smooth lower boundary, 2Ab horizon.
4	46–54 cm	Dark gray (10YR 4/1) firm clay loam, weak fine subangular blocky structure, few dispersed small limestone gravels, common roots and rootlets, many $CaCO_3$ filaments, few snail shells, clear smooth lower boundary, 2Bwb horizon.
5	54–70 cm	Dark gray (10YR 4/1) friable very gravelly clay loam, structureless, few roots and rootlets, few pieces of charcoal, many $CaCO_3$ filaments, clear smooth lower boundary, 2C horizon.
6	70–95 cm	Very dark gray (10YR 3/1) firm clay loam, moderate fine angular blocky structure, one 5–10-cm-thick very gravelly colluvial wedge within the zone, many $CaCO_3$ filaments, few roots and rootlets, few snail shells, common pieces of charcoal, clear smooth lower boundary, 3Ab horizon.
7	95–120+ cm	Dark gray (10YR 4/1) firm very gravelly to very cobbly clay loam, few rootlets, lower boundary not observed, 3C horizon.

Backhoe Trench 1, south wall

1	0–40 cm	Very dark grayish brown (10YR 3/2) firm very gravelly clay loam, structureless, many roots and rootlets, common organic materials, common

Zone	Depth (cm)	Description
		snail shells, abrupt smooth lower boundary, A horizon.
2	40–81 cm	Dark grayish brown (10YR 4/2) very firm gravelly clay loam, moderate medium subangular blocky structure, common roots and rootlets, common snail shells, few charcoal flecks, few organic materials, abrupt smooth lower boundary, C horizon.
3	81–129+ cm	Dark brown (10YR 4/3) very firm gravelly clay loam, moderate medium subangular blocky structure, few rootlets, common thin $CaCO_3$ coatings on gravelly clasts, few snail shells, few to common $CaCO_3$ filaments, lower boundary not observed, Ck horizon.

Backhoe Trench 2, south wall

1	0–44 cm	Very dark grayish brown (10YR 3/2) firm gravelly clay loam, weak coarse granular structure, many roots and rootlets, common snail shells, common organic materials, abrupt smooth lower boundary, A horizon.
2	44–71 cm	Brown (10YR 5/3) firm gravelly silty clay, weak fine subangular blocky structure, common roots and rootlets, few organic materials, clear smooth lower boundary, C horizon.
3	71–96+ cm	Pale brown (10YR 6/3) firm very gravelly silty clay, moderate fine subangular blocky structure, common thin $CaCO_3$ coatings on gravelly clasts, few rootlets, few organic materials, lower boundary not observed, Ck horizon.

Backhoe Trench 3, south wall

1	0–45 cm	Very dark gray (10YR 3/1) firm very gravelly clay loam, moderate fine angular blocky structure, many roots and rootlets, common organic materials, clear smooth lower boundary, A horizon.
2	45–94 cm	Dark grayish brown (10YR 4/2) firm very cobbly clay loam, weak fine subangular blocky structure, few roots and rootlets, clear smooth lower boundary, C horizon.
3	94–133+ cm	Dark gray (10YR 4/1) firm gravelly clay, strong medium subangular blocky structure, common thin $CaCO_3$ coatings on gravelly clasts, few roots and rootlets, many $CaCO_3$ filaments, lower boundary not observed, Ck horizon.

Backhoe Trench 4, south wall

1	0–23 cm	Very dark gray (10YR 3/1) firm gravelly clay loam, weak fine subangular blocky structure, common pieces of charcoal, many roots and rootlets, few snail shells, clear smooth lower boundary, A horizon.
2	23–48 cm	Very dark gray (5YR 3/1) firm very gravelly clay loam, moderate fine subangular blocky structure, common roots and rootlets, abrupt smooth lower boundary, C horizon.

Zone	Depth (cm)	Description
3	48–64+ cm	Dark grayish brown (10YR 4/2) firm very gravelly to very cobbly clay loam, moderate fine subangular blocky structure, few roots and rootlets, lower boundary not observed, C2 horizon.

Backhoe Trench 5, north wall

1	0–23 cm	Very dark grayish brown (10YR 3/2) firm very gravelly clay loam, structureless, few snail shells, many roots and rootlets, common organic materials, clear smooth lower boundary, A horizon.
2	23–85+ cm	Light brown (7.5YR 6/4) firm very cobbly clay, structureless, few roots and rootlets, lower boundary not observed, C horizon.

41CV944 Shelter A

Test Unit 1, south wall

1	0–3 cm	Pale brown (10YR 6/3) friable silt, structureless, common granule- to pebble-sized spalls, abrupt smooth lower boundary, C horizon.
2	3–6 cm	Dark grayish brown (2.5Y 4/2) friable silt loam, structureless, few roots and rootlets, common granule-sized spalls, abrupt wavy lower boundary, 2AC horizon.
3	6–20 cm	Pale brown (10YR 6/3) friable silt, structureless, common granule- to pebble-sized spalls, abrupt smooth lower boundary, 2C horizon.
4	20–40 cm	Weathered limestone bedrock, Cr horizon.

Test Unit 2, north wall

1	0–7 cm	Pale brown (10YR 6/3) friable silt, structureless, common granule- to pebble-sized spalls, very abrupt smooth lower boundary, C horizon.
2	7–12 cm	Dark grayish brown (2.5Y 4/2) friable silt loam, structureless, common pieces of charcoal, common granule-sized spalls, abrupt smooth lower boundary, 2AC horizon.
3	12–22 cm	Dark gray (10YR 4/1) friable silt loam, structureless, common roots and rootlets, common granule- and pebble-sized spalls, abrupt wavy lower boundary, 2C horizon.
4	22–26+ cm	Weathered limestone bedrock, Cr horizon.

41CV944 Shelter B

Test Unit 4, south wall

1	0–5 cm	Very pale brown (10YR 7/4) friable silt, structureless, few roots and

Zone	Depth (cm)	Description
		rootlets, common granule- to pebble-sized spalls but few cobble-sized spalls, clear smooth lower boundary, C horizon.
2	5–21 cm	Very pale brown (10YR 8/3) friable silt, structureless, few roots and rootlets, one rodent burrow, common granule- to pebble-sized spalls, abrupt wavy lower boundary, C2 horizon.
3	21–33+ cm	Weathered limestone bedrock, Cr horizon.

Test Unit 5, west wall

1	0–10 cm	Brown (10YR 5/3) loose silt, C horizon.
2	10–22 to 50+ cm	Pale yellow (5Y 8/4) loose silt, Cu horizon.

41CV1348 Subarea A, Shelter 1

Test Unit 1, east wall

1	0–16 cm	Dark grayish brown (10YR 4/2) friable sandy clay loam, structureless, common roots and rootlets, many organic materials, common granule- to pebble-sized spalls, abrupt wavy lower boundary, C horizon.
2	16–35 cm	Very pale brown (10YR 7/3) friable sandy loam, structureless, common roots and rootlets, many granule- to pebble-sized spalls, few organic materials, abrupt smooth lower boundary, C2 horizon.
3	35–50 cm	Very dark grayish brown (10YR 3/2) firm clay loam, structureless, few roots and rootlets, many granule-, pebble-, and cobble-sized spalls, common organic materials, abrupt wavy lower boundary, limestone bedrock at 50 cm, C3 horizon.

Test Unit 3, north wall

1	0–9 cm	Very pale brown (10YR 7/3) friable silt loam, structureless, few roots and rootlets, few granule- to pebble-sized spalls, abrupt smooth lower boundary, C horizon.
2	9–21 cm	Very pale brown (10YR 7/4) friable silt loam, structureless, few roots and rootlets, few granule- to small pebble-sized spalls, abrupt smooth lower boundary, C2 horizon.
3	21–43 cm	Dark brown (10YR 3/3) firm clay loam, structureless, common roots and rootlets, few organic materials, many granule-, pebble-, and cobble-sized spalls, abrupt wavy lower boundary, limestone bedrock at 43 cm, C3 horizon.

41CV1348 Subarea A, Shelter 2

Test Unit 2, east wall

1	0–38 cm	Very dark grayish brown (10YR 3/2) firm clay loam, structureless, common

Zone	Depth (cm)	Description
		roots and rootlets, many granule-, pebble-, and cobble-sized spalls, abrupt broken lower boundary, limestone bedrock at 38 cm, AC horizon.

41CV1473

Backhoe Trench 1, west wall

1	10–42 cm	Dark grayish brown (10YR 4/2) friable silt loam, weak fine subangular blocky structure, many roots and rootlets, common pedotubules, few dispersed small limestone gravels, common organic materials, abrupt smooth to broken lower boundary. Holocene colluvium, A horizon.
2	42–81 cm	Strong brown (7.5YR 5/6) friable silty clay loam, moderate medium subangular blocky structure, few distinct medium mottles (10YR 4/2) in upper half of zone, many roots and rootlets, few charcoal flecks, few organic materials, common pedotubules, abrupt smooth lower boundary. Late Pleistocene Jackson alluvium, 2Bt horizon.
3	81–113+ cm	Brownish yellow (10YR 6/6) friable silt loam, moderate medium subangular blocky structure, common roots and rootlets, common soft $CaCO_3$ bodies (10–20 mm), common hard $CaCO_3$ nodules (3–5 mm), lower boundary not observed. Late Pleistocene Jackson alluvium, 2Ck horizon.

41CV1478

Backhoe Trench 1, west wall

1	0–32 cm	Dark grayish brown (10YR 4/2) firm clay loam, weak medium subangular blocky structure, many roots and rootlets, few snail shells, common pedotubules, clear smooth lower boundary. Late Holocene Ford alluvium, AC horizon.
2	32–69 cm	Dark grayish brown (10YR 4/2) firm clay loam, moderate medium subangular blocky structure, common faint medium mottles (10YR 6/4), common roots and rootlets, common pedotubules, few snail shells, thick laminae of sand at 69 cm, clear smooth lower boundary. Late Holocene Ford alluvium, C horizon.
3	69–94 cm	Dark gray (10YR 4/1) firm clay, moderate medium subangular blocky structure, common roots and rootlets, common pedotubules, common organic materials, few snail shells, abrupt smooth lower boundary. Late Holocene Ford alluvium, 2Ab horizon.
4	94–115 cm	Intercalated light yellowish brown (10YR 6/4) sand and dark gray (10YR 4/1) mud ripples, friable, few pedotubules, few rootlets, abrupt smooth lower boundary. Late Holocene Ford alluvium, 2Cu horizon.
5	115–141 cm	Dark grayish brown (10YR 4/2) firm clay, moderate medium subangular blocky structure, common roots and rootlets, few pedotubules, few snail

Zone	Depth (cm)	Description
		shells, few $CaCO_3$ filaments, few charcoal flecks, few clay-filled krotovina (10YR 4/1), gradual smooth lower boundary. Late Holocene Ford alluvium, 3AC horizon.
6	141–218 cm	Grayish brown (2.5Y 5/2) firm clay, moderate medium subangular blocky structure, few roots and rootlets, few charcoal flecks, common snail shells, common $CaCO_3$ filaments, abrupt smooth lower boundary. Late Holocene Ford alluvium, 3C horizon.
7	218–316+ cm	Very dark gray (10YR 3/1) very firm clay, moderate medium angular blocky structure, few rootlets, few snail shells, few pieces of culturally burned rock, few pieces of freshwater mussel shell, lower boundary not observed. Late Holocene West Range alluvium/Leon River paleosol, 4Ab horizon.

<u>Backhoe Trench 3, south wall</u>

Zone	Depth (cm)	Description
1	0–32 cm	Dark grayish brown (10YR 4/2) friable sandy clay loam, poorly preserved intercalated sand and mud ripples, common distinct coarse sandy mottles (10YR 5/4), many roots and rootlets, common pedotubules, common organic materials, common snail shells, abrupt smooth lower boundary. Late Holocene Ford alluvium, AC horizon.
2	32–62 cm	Dark gray (10YR 4/1) firm clay loam, moderate medium angular blocky structure, few sand-filled pedotubules, common roots and rootlets, few snail shells, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2Ab horizon.
3	62–119 cm	Dark gray (10YR 4/1) firm clay loam, moderate fine angular blocky structure, common roots and rootlets, common $CaCO_3$ filaments, few snail shells, gradual smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2Bk horizon.
4	119–172 cm	Very dark grayish brown (10YR 3/2) firm clay loam, moderate medium angular blocky structure, few to common (increasing in number downprofile) faint medium mottles, common roots and rootlets, common $CaCO_3$ filaments, few snail shells, few pieces of culturally burned rock, few freshwater mussel shells, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2Bk2 horizon.
5	172–222+ cm	Brown to dark brown (10YR 4/3) very firm clay, strong medium angular blocky structure, few roots and rootlets, many $CaCO_3$ filaments, lower boundary not observed. Late Holocene West Range alluvium, 2Ck horizon.

41CV1479

<u>Backhoe Trench 2, west wall</u>

Zone	Depth (cm)	Description
1	0–14 cm	Brown to dark brown (10YR 4/3) firm clay loam, structureless, few dispersed small limestone gravels, many roots and rootlets, common organic materials, abrupt smooth lower boundary. Artificial fill, C horizon.

Zone	Depth (cm)	Description
2	14–18 cm	Dark yellowish brown (10YR 4/4) friable massive muddy gravel, common roots and rootlets, few pieces of charcoal, abrupt smooth lower boundary. Artificial fill, C2 horizon.
3	18–91 cm	Dark grayish brown (10YR 4/2) firm clay loam, moderate medium angular blocky structure, common roots and rootlets, few pedotubules, few snail shells, common organic materials, common $CaCO_3$ filaments, few thin laminae of sand at 84 to 86 cm, abrupt smooth lower boundary. Late Holocene Ford alluvium, 2AC horizon.
4	91–121 cm	Intercalated yellowish brown (10YR 5/4) fine sand and dark yellowish brown (10YR 4/4) firm sandy clay loam, few roots and rootlets, few $CaCO_3$ filaments, sand beds contain thin mud ripples, few krotovina, abrupt wavy lower boundary. Late Holocene Ford alluvium, 2C horizon.
5	121–172 cm	Brown to dark brown (10YR 4/3) firm clay loam, moderate medium angular blocky structure, few to common distinct medium sandy mottles (10YR 5/4), common rootlets, common snail shells, common slickensides on ped faces, abrupt wavy lower boundary. Late Holocene Ford alluvium, 3Bwb horizon.
6	172–194 cm	Dark brown (10YR 3/3) firm clay loam, moderate medium angular blocky structure, common snail shells, few rootlets, clear smooth lower boundary, conventional radiocarbon age of 1160 ± 40 B.P. on soil humates at 176–186 cm. Late Holocene West Range alluvium/Leon River paleosol, 4Ab horizon.
7	194–261 cm	Dark grayish brown (10YR 4/2) firm clay, moderate medium angular blocky structure, few rootlets, few snail shells, few pieces of culturally burned rocks, gradual smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 4Bwb horizon.
8	261–330+ cm	Grayish brown (10YR 5/2) firm silty clay loam, weak medium angular blocky structure, few rootlets, few snail shells, lower boundary not observed. Late Holocene West Range alluvium, 4C horizon.

Backhoe Trench 3, southeast wall

Zone	Depth (cm)	Description
1	0–55 cm	Dark brown (10YR 3/3) firm clay loam, moderate medium subangular blocky structure, few distinct fine mottles (10YR 6/3), few charcoal flecks, many roots and rootlets, common pedotubules, common snail shells, gradual smooth lower boundary. Late Holocene Ford alluvium, A horizon.
2	55–75 cm	Grayish brown (10YR 5/2) firm loam, moderate medium subangular blocky structure, common roots and rootlets, few pedotubules, few snail shells, clear smooth lower boundary. Late Holocene Ford alluvium, Bw horizon.
3	75–171 cm	Intercalated very thin to thin beds of brown (10YR 5/3) fine sand and grayish brown (10YR 5/2) firm clay, few roots and rootlets, few charcoal flecks, abrupt smooth lower boundary. Late Holocene Ford alluvium, C horizon.

Zone	Depth (cm)	Description
4	171–230 cm	Dark gray (10YR 4/1) firm clay loam, moderate medium subangular blocky structure, few distinct medium sandy mottles (10YR 5/3), few roots and rootlets, few snail shells, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2Ab horizon.
5	230–256 cm	Very dark gray (5YR 3/1) very firm clay, moderate coarse angular blocky structure, few roots and rootlets, common snail shells, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2ABwb horizon.
6	256–320+ cm	Dark gray (10YR 4/1) very firm clay, moderate medium angular blocky structure, few charcoal flecks, few snail shells, lower boundary not observed. Late Holocene West Range alluvium, 2C horizon.

41CV1480

Backhoe Trench 2, northwest wall

1	0–41 cm	Dark gray (10YR 4/1) firm clay loam, weak fine subangular blocky structure, common distinct coarse sandy mottles (10YR 4/3) in bottom half of zone, common pieces of charcoal, many roots and rootlets, few snail shells, common pedotubules, clear smooth lower boundary. Late Holocene Ford alluvium, A horizon.
2	41–56 cm	Intercalated poorly preserved brown (10YR 5/3) fine sand and dark gray (10YR 4/1) mud ripples, common roots and rootlets, common pieces of charcoal and charcoal flecks, common sand-sized carbonate clasts, common pedotubules, abrupt smooth lower boundary. Late Holocene Ford alluvium, C horizon.
3	56–71 cm	Yellowish brown (10YR 5/4) friable loamy sand, poorly preserved sand and mud ripples, common roots and rootlets, common sand-sized carbonate clasts, abrupt smooth lower boundary. Late Holocene Ford alluvium, C2 horizon.
4	71–100 cm	Very dark grayish brown (10YR 3/2) firm clay loam, moderate medium subangular blocky structure, common roots and rootlets, few charcoal flecks, common sand-sized carbonate clasts, few snail shells, very thin beds of sand at 94 and 100 cm, very abrupt smooth lower boundary. Late Holocene Ford alluvium, 2Ab horizon.
5	100–165 cm	Dark gray (10YR 4/1) firm clay loam, moderate medium angular blocky structure, few distinct medium sandy mottles (10YR 5/4), common roots and rootlets, few charcoal flecks, common snail shells, few sand-sized carbonate clasts, thin bed of sand with mud ripples at 130 cm, gradual smooth lower boundary. Late Holocene Ford alluvium, 3Ab horizon.
6	165–236 cm	Dark grayish brown (10YR 4/2) firm sandy clay, moderate medium angular blocky structure, few roots and rootlets, common snail shells, common pieces of charcoal, thin bed of sand at 236 cm, abrupt smooth lower boundary. Late Holocene Ford alluvium, 3Bwb horizon.

Zone	Depth (cm)	Description
7	236–296+ cm	Dark brown (10YR 3/3) firm clay loam grading down-profile to firm sandy clay loam, moderate medium angular blocky structure, few snail shells, common charcoal flecks, common rootlets, very thin beds of sand at 248 and 270 cm, lower boundary not observed. Late Holocene Ford alluvium, 3BC horizon.

Backhoe Trench 3, southeast wall

Zone	Depth (cm)	Description
1	0–21 cm	Dark gray (10YR 4/1) firm clay loam, weak fine subangular blocky structure, many roots and rootlets, common pedotubules, common snail shells, many organic materials, abrupt smooth lower boundary. Late Holocene Ford alluvium, A horizon.
2	21–40 cm	Grayish brown (10YR 5/2) friable loam, moderate medium angular blocky structure, few distinct medium sandy mottles (10YR 4/3), many roots and rootlets, common pedotubules, common organic materials, few snail shells, abrupt to clear wavy to broken lower boundary. Late Holocene Ford alluvium, Bw horizon.
3	40–57 cm	Poorly preserved intercalated beds of brown (10YR 5/3) fine sand and grayish brown (10YR 5/2) firm mud, sand beds contain thin (1 mm) mud ripples, common roots and rootlets, common snail shells, common pedotubules, clear smooth lower boundary. Late Holocene Ford alluvium, C horizon.
4	57–114 cm	Dark grayish brown (10YR 4/2) firm clay loam, moderate coarse subangular blocky structure, few distinct coarse sandy mottles (10YR 5/3), common roots and rootlets, few snail shells, few charcoal flecks, few pedotubules, few sand-sized carbonate clasts, poorly preserved thin beds of sand at 92 and 106 cm, abrupt smooth lower boundary. Late Holocene Ford alluvium, 2AC horizon.
5	114–142 cm	Dark gray (10YR 4/1) very firm clay to clay loam, moderate medium subangular blocky structure, common pieces of charcoal and charcoal flecks, common dispersed small limestone gravels, common snail shells, few $CaCO_3$ filaments, few roots and rootlets, gradual smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 3Ab horizon.
6	142–177 cm	Dark gray (10YR 4/1) very firm clay, moderate medium angular blocky structure, few roots and rootlets, few snail shells, common charcoal flecks, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 3Bwb horizon.
7	177–289+ cm	Dark grayish brown (10YR 4/2) very firm clay loam, moderate medium angular blocky structure, few roots and rootlets, few snail shells, freshwater mussel shell at 211 cm, lower boundary not observed. Late Holocene West Range alluvium, 3C horizon.

41CV1482

Backhoe Trench 1, east wall

Zone	Depth (cm)	Description
1	0–65 cm	Grayish brown (2.5Y 5/2) firm silty clay loam, weak medium angular

Zone	Depth (cm)	Description
		blocky structure, common prominent coarse mottles (10YR 5/3), few snail shells, many roots and rootlets, common pedotubules, common organic materials, abrupt smooth to wavy lower boundary. Late Holocene Ford alluvium, AC horizon.
2	65–119 cm	Dark gray (10YR 4/1) firm clay, moderate medium subangular blocky structure, common distinct coarse mottles (7.5YR 5/3), common roots and rootlets, few pieces of culturally burned rocks, few freshwater mussel shells, common dispersed limestone gravels, few snail shells, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2Ab horizon.
3	119–220 cm	Brown (7.5YR 5/3) firm clay, moderate to strong medium angular blocky structure, common distinct fine mottles (10YR 4/1), common snail shells, few rootlets, few $CaCO_3$ filaments, gradual smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2Bwb horizon.
4	220–300+ cm	Yellowish brown (10YR 5/4) very firm clay, moderate to strong medium angular blocky structure, few snail shells, common $CaCO_3$ filaments, lower boundary not observed. Late Holocene West Range alluvium, 2Ck horizon.

<u>Backhoe Trench 4, north wall</u>

Zone	Depth (cm)	Description
1	0–68 cm	Dark grayish brown (2.5Y 4/2) firm clay loam, moderate medium angular blocky structure, few prominent medium mottles (10YR 3/1), many roots and rootlets, common pedotubules, common snail shells, abrupt smooth lower boundary. Late Holocene Ford alluvium, AC horizon.
2	68–91 cm	Very dark gray (10YR 3/1) very firm clay, moderate medium angular blocky structure, common $CaCO_3$ filaments, common roots and rootlets, few pedotubules, few pieces of culturally burned rocks, common freshwater mussel shells, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2Ab horizon.
3	91–180 cm	Dark gray (10YR 4/1) firm clay loam, moderate medium angular blocky structure, common dispersed small limestone gravels, common charcoal flecks, few roots and rootlets, common $CaCO_3$ filaments, common pieces of culturally burned rocks and freshwater mussel shells in top half of zone, gradual smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 2Bwb horizon.
4	180–260+ cm	Dark grayish brown (10YR 4/2) firm silty clay loam, moderate medium angular blocky structure, few rootlets, common snail shells, lower boundary not observed. Late Holocene West Range alluvium, 2C horizon.

41CV1487

<u>Backhoe Trench 1, east wall</u>

Zone	Depth (cm)	Description
1	0–27 cm	Very dark grayish brown (10YR 3/2) firm clay loam, moderate fine

Zone	Depth (cm)	Description
		subangular blocky structure, many roots and rootlets, common organic materials, common pedotubules, clear smooth lower boundary. Late Holocene Ford alluvium, A horizon.
2	27–63 cm	Yellowish brown (10YR 5/4) friable silty clay loam, moderate fine subangular blocky structure, many roots and rootlets, common pedotubules, few organic materials, few hard $CaCO_3$ nodules (redeposited) along lower boundary of zone, common illuvial clays (10YR 3/2) in top half of zone, one thin band of clays in translocation at 36 cm, abrupt smooth lower boundary. Late Holocene colluvium (redeposited Jackson alluvium from the T_2 terrace), Bw horizon.
3	63–71 cm	Brown (10YR 5/3) firm loam, weak fine subangular blocky structure, common distinct medium sandy mottles (10YR 5/4), common roots and rootlets, common small clay-filled krotovinas, few snail shells, abrupt smooth lower boundary. Late Holocene Ford alluvium, 2AC horizon.
4	71–85 cm	Light yellowish brown (10YR 6/4) friable sandy loam, poorly preserved sand and mud ripples, many prominent medium clayey mottles (10YR 5/3), common small clay-filled krotovinas, common roots and rootlets, common illuvial clays, abrupt smooth lower boundary. Late Holocene Ford alluvium, 2C horizon.
5	85–115 cm	Very dark gray (10YR 3/1) very firm clay loam, moderate medium subangular blocky structure, common roots and rootlets, few small clay-filled krotovinas, few snail shells, few $CaCO_3$ filaments, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 3Ab horizon.
6	115–199 cm	Black (5Y 2.5/1) grading down-profile to very dark gray (5Y 3/1) very firm clay, moderate medium angular blocky structure, few faint fine mottles (10YR 5/4) increasing in number with depth, common snail shells, few roots and rootlets, common $CaCO_3$ filaments, clear smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 3ABb horizon.
7	199–260 cm	Dark gray (10YR 4/1) very firm clay, strong medium angular blocky structure, common small hard $CaCO_3$ nodules, common snail shells, gradual smooth lower boundary. Late Holocene West Range alluvium/Leon River paleosol, 3Bk horizon.
8	260–380 cm	Brown (10YR 5/3) very firm clay loam, moderate medium angular blocky structure, common small hard $CaCO_3$ nodules, few snail shells, clear smooth lower boundary. Late Holocene West Range alluvium, 3Ck horizon.
9	380–419+ cm	Brown (10YR 5/3) very firm clay loam, strong medium angular blocky structure, common prominent medium to coarse mottles (gleyed), few snail shells, few $CaCO_3$ nodules, common sandy dendritic patterns, lower boundary not observed. Late Holocene West Range alluvium, 3Cg horizon.

Zone	Depth (cm)	Description

41CV1549

Backhoe Trench 1, north wall

1	0–26 cm	Dark grayish brown (10YR 4/2) firm silty clay loam, moderate medium subangular blocky structure, common roots and rootlets, few pedotubules, few pieces of culturally burned rocks and chert debitage, abrupt smooth lower boundary. Late Holocene upper West Range alluvium, A horizon.
2	26–93 cm	Grayish brown (10YR 5/2) firm silty clay loam, moderate medium subangular blocky structure, many $CaCO_3$ filaments, few pedotubules, common roots and rootlets, clear smooth lower boundary. Late Holocene upper West Range alluvium, Bk horizon.
3	93–316 cm	Grayish brown (10YR 5/2) firm sandy clay loam, moderate medium angular blocky structure, few $CaCO_3$ filaments, few rootlets, few pedotubules, few charcoal flecks, clear smooth lower boundary. Late Holocene upper West Range alluvium, B horizon.
4	316–337+ cm	Dark grayish brown (10YR 4/2) very firm clay loam, moderate medium angular blocky structure, very few dispersed small limestone gravels, few $CaCO_3$ filaments, lower boundary not observed. Late Holocene upper West Range alluvium, 2Ab horizon.

Backhoe Trench 2, north wall

1	0–33 cm	Dark grayish brown (10YR 4/2) firm silty clay loam, moderate medium subangular blocky structure, common roots and rootlets, few snail shells, common pedotubules, clear smooth lower boundary. Late Holocene upper West Range alluvium, A horizon.
2	33–105 cm	Brown (10YR 5/3) firm sandy clay loam, moderate medium subangular blocky structure, many $CaCO_3$ filaments, few rootlets, few snail shells, clear smooth lower boundary. Late Holocene upper West Range alluvium, Bk horizon.
3	105–178 cm	Brown (10YR 5/3) firm sandy clay loam, weak medium subangular blocky structure, few snail shells, few $CaCO_3$ filaments, few rootlets, clear smooth lower boundary. Late Holocene upper West Range alluvium, C horizon.
4	178–206 cm	Brown (10YR 5/3) firm loam, moderate medium angular blocky structure, few rootlets, few pedotubules, clear smooth lower boundary. Late Holocene upper West Range alluvium, 2Ab horizon.
5	206–272 cm	Brown (10YR 5/3) very firm sandy clay, strong medium angular blocky structure, few rootlets, many $CaCO_3$ filaments, few very small limestone gravels, clear smooth lower boundary. Late Holocene upper West Range alluvium, 2Bkb horizon.
6	272–304 cm	Brown (10YR 5/3) firm gravelly clay loam, strong medium angular blocky structure, common distinct medium mottles (10YR 6/3 to 6/4), abrupt

Zone	Depth (cm)	Description
		wavy to broken lower boundary. Late Holocene lower West Range alluvium, 3C horizon.
7	304–329 cm	Light yellowish brown (10YR 6/4) friable to firm sandy clay loam, moderate to strong medium subangular blocky structure, many distinct coarse mottles (10YR 7/4), few dispersed small limestone gravels, clear smooth lower boundary. Late Pleistocene to early Holocene Georgetown alluvium/ Royalty paleosol, 4Bt horizon.
8	329–378+ cm	Very pale brown (10YR 7/4) friable sandy clay, moderate medium angular blocky structure, common prominent medium mottles (10YR 6/8), few dispersed small limestone gravels, lower boundary not observed. Late Pleistocene to early Holocene Georgetown alluvium, 4C horizon.

Backhoe Trench 4, south wall

Zone	Depth (cm)	Description
1	0–47 cm	Dark gray (10YR 4/1) friable sandy clay loam, moderate medium angular blocky structure, common roots and rootlets, many sand-sized carbonate clasts, common pedotubules, common organic materials, gradual smooth lower boundary. Late Holocene upper West Range alluvium, A horizon.
2	47–109 cm	Grayish brown (10YR 5/2) friable sandy clay loam, moderate medium subangular blocky structure, few roots and rootlets, few pedotubules, few dispersed very small limestone gravels, many $CaCO_3$ filaments, gradual smooth lower boundary. Late Holocene upper West Range alluvium, Bk horizon.
3	109–156 cm	Pale brown (10YR 6/3) friable loam, moderate medium angular blocky structure, few roots and rootlets, common traces of leached $CaCO_3$ filaments, few pedotubules, abrupt smooth lower boundary. Late Holocene upper West Range alluvium, C horizon.
4	156–188 cm	Pale brown (10YR 6/3) friable sandy loam, moderate fine angular blocky structure, common snail shells, few rootlets, few charcoal flecks, common sand-sized carbonate clasts, abrupt smooth lower boundary. Late Holocene upper West Range alluvium, C2 horizon.
5	188–208 cm	Light yellowish brown (10YR 6/4) friable sandy clay loam, moderate medium angular blocky structure, common charcoal flecks, few rootlets, few $CaCO_3$ filaments, few snail shells, abrupt smooth lower boundary. Late Holocene upper West Range alluvium, C3 horizon.
6	208–237 cm	Light olive brown (2.5Y 5/3) firm clay loam, moderate fine angular blocky structure, few rootlets, common charcoal flecks, few snail shells, few sand-sized carbonate clasts, abrupt smooth lower boundary. Late Holocene upper West Range alluvium, C4 horizon.
7	237–255 cm	Brown (10YR 5/3) firm silty clay, moderate medium angular blocky structure, few sand-sized carbonate clasts, few snail shells, few rootlets, few pedotubules, common charcoal flecks, 1-cm-thick lens of charcoal and ashy sediment at top of zone, clear smooth lower boundary. Late Holocene

Zone	Depth (cm)	Description
		lower West Range alluvium, 2Ab horizon.
8	255–279 cm	Brown (10YR 5/3) firm sandy clay loam, moderate medium angular blocky structure, few charcoal flecks, few sand-sized carbonate clasts, few rootlets, few dispersed small limestone gravels, abrupt smooth lower boundary. Late Holocene lower West Range alluvium, 2Bw horizon.
9	279–336+ cm	Pale brown (10YR 6/3) friable sandy loam, moderate medium angular blocky structure, very few sand-sized carbonate clasts, common charcoal flecks, one freshwater mussel shell in lower third of zone, lower boundary not observed. Late Holocene lower West Range alluvium, 2C horizon.

Backhoe Trench 6, south wall

Zone	Depth (cm)	Description
1	0–42 cm	Dark grayish brown (10YR 4/2) firm loam, moderate medium subangular blocky structure, many roots and rootlets, common pedotubules, common organic materials, gradual smooth lower boundary. Late Holocene upper West Range alluvium, A horizon.
2	42–93 cm	Grayish brown (10YR 5/2) firm clay loam, moderate medium subangular blocky structure, common roots and rootlets, few snail shells, few $CaCO_3$ filaments, few pedotubules, gradual smooth lower boundary. Late Holocene upper West Range alluvium, Bw horizon.
3	93–269+ cm	Brown (10YR 5/3) firm silty clay, moderate medium angular blocky structure, common snail shells, common $CaCO_3$ filaments, few rootlets, lower boundary not observed. Late Holocene upper West Range alluvium, Ck horizon.

Backhoe Trench 7, east wall

Zone	Depth (cm)	Description
1	0–44 cm	Dark gray (10YR 4/1) firm clay loam, moderate medium subangular blocky structure, many roots and rootlets, common organic materials, few snail shells, few charcoal flecks, clear smooth lower boundary. Late Holocene Ford alluvium, A horizon.
2	44–100 cm	Grayish brown (10YR 5/2) friable sandy clay loam, moderate medium subangular blocky structure, common sand-sized carbonate clasts, common roots and rootlets, few pedotubules, few organic materials, clear smooth lower boundary. Late Holocene Ford alluvium, B horizon.
3	100–152 cm	Brown (10YR 5/3) friable sandy loam (sand component coarsens upward), moderate medium angular blocky structure, few distinct medium mottles (10YR 4/2), common roots and rootlets, few sand-sized carbonate clasts in upper half of zone, few snail shells, few charcoal flecks, abrupt to clear smooth lower boundary. Late Holocene Ford alluvium, C horizon.
4	152–180 cm	Dark grayish brown (10YR 4/2) friable loam, moderate medium subangular blocky structure, common prominent coarse mottles (10YR 5/3) in upper half of zone, common roots and rootlets, few $CaCO_3$ filaments, few snail shells, few charcoal flecks, gradual smooth lower

Zone	Depth (cm)	Description
		boundary. Late Holocene upper West Range alluvium, 2Ab horizon.
5	180–251 cm	Brown (10YR 5/3) firm sandy clay loam, moderate fine angular blocky structure, common roots and rootlets, few sand-sized carbonate clasts, few snail shells, few charcoal flecks, clear smooth lower boundary. Late Holocene upper West Range alluvium, 2Bwb horizon.
6	251–274 cm	Grayish brown (10YR 5/2) firm clay loam, moderate fine angular blocky structure, few rootlets, few snail shells, few charcoal flecks, clear smooth lower boundary. Late Holocene upper West Range alluvium, 3Ab horizon.
7	274–344+ cm	Brown (10YR 5/3) firm sandy clay loam (sand component fines upward), moderate medium angular blocky structure, few rootlets, few snail shells, lower boundary not observed. Late Holocene upper West Range alluvium, 3Bwb horizon.

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APPENDIX C: Faunal Analysis

Barry W. Baker

INTRODUCTION

This appendix presents an analysis of faunal remains (n = 1,433) recovered from archeological testing at 10 prehistoric sites on Fort Hood, Texas (Bell and Coryell Counties). Given the nature of the sample and the lack of contextual knowledge, a detailed site-by-site or comparative analysis was not undertaken. The focus is a descriptive presentation of the faunal remains in conjunction with taphonomic observations. Given the late Pleistocene radiocarbon age obtained from the lower shelter deposits at 41BL581, this site is examined in more detail.

PREVIOUS FAUNAL INVESTIGATIONS

Previous investigations of Fort Hood archeofaunas include studies by Baker (1995), Sanchez (1993), Sanchez and Shaffer (1993a, 1993b), Shaffer (1995), and Neck (1993). Amino acid racemization studies of archeological land snails (*Rabdotus*) from Fort Hood are reported by Abbott et al. (1995), Ellis (1994), Ellis and Goodfriend (1994), and Ellis et al. (1994). In addition, Baker (1993, 1994:29–57) and Black (1989:33–34) summarize general prehistoric subsistence data for Central Texas.

METHODS

Faunal remains were collected in the field with ¼-inch screens, as well as from flotation samples. Sites reflect both open and rockshelter deposits. Specimens were identified in conjunction with comparative materials as precisely as possible based on structural features and regional biogeography. In addition, the following identification guides were also consulted: Balkwill and Cumbaa (1992), Brown and Gustafson (1989), Ford (1990), Gilbert (1980), Gilbert et al. (1985), Glass (1951), Lawrence (1951), Olsen (1960, 1968), and Schmid (1972).

Specimens were coded using a modified version of information presented in Shaffer and Baker (1992). Data were manipulated in dBase (III+) following Carlson and Shaffer (1992). The following information was recorded for each specimen where applicable: site, lot number, quantity, taxon, element, portion of element, side, age, age criteria, weathering, breakage pattern, burning, gnawing, and cut mark data. Additional observations were recorded in a "Comments" field. In limited cases, morphometric data were collected following Driesch (1976). Specimens broken in dry bone fractures that could be refitted were coded as one specimen. Maxillae and mandibles retaining teeth also were coded as one specimen, with teeth described in the "Comments" field.

Specimens not identifiable to a specific taxon were assigned to general body size classes where possible. Definitions of the size categories used here are as follows: medium sized bird (large perching birds); large bird (duck, turkey sized, or larger); micromammal (mouse sized); small mammal (rabbit sized or smaller); small rodent (mouse sized); medium-sized rodent (rat/gopher sized); medium-sized cricetid (rat-sized cricetid); small to medium-sized mammal (canid sized or smaller); medium-sized mammal (larger than jackrabbit to canid sized); medium-sized to large mammal (canid to deer sized); large to very large mammal (deer to cow sized); and very large mammal (cow sized).

DISCUSSION

Taxa Representation

Roughly 17 percent (n = 240) of the total sample (n = 1,433) was identified to order, family, genus, or species (Tables 75 and 76). At least 18 species are represented in the assemblage, reflecting four vertebrate classes: Amphibia (amphibians), Reptilia (reptiles), Aves (birds), and Mammalia (mammals).

The 18 discrete taxa identified are Anura (frog/toad), Kinosternidae (mud and musk turtles), Colubridae (nonpoisonous snakes), Viperidae (poisonous snakes), medium-sized bird, large bird, *Lepus californicus* (California jackrabbit), *Sylvilagus* sp. (cottontail rabbit), Sciuridae (squirrel), *Geomys* sp. (gopher), *Castor canadensis* (beaver), *Sigmodon hispidus* (hispid cotton rat), *Ondatra zibethicus* (muskrat), Mustelidae (mustelid), *Canis* sp. (coyote/wolf/dog), *Felis rufus* (bobcat), *Odocoileus virginianus* (white-tailed deer), and *Bos taurus* (domestic cow). Mammals (52.2 percent, n = 748) dominate the total sample, followed by unidentified fragments (45.3 percent, n = 649), reptiles (2.0 percent, n = 28), birds (0.5 percent, n = 7), and amphibians (<.1 percent, n = 1), respectively. These taxa represent a range of habitats, including forest, forest edge, and riparian settings. The

Table 75. Faunal taxa identified from sites 41BL155b, 41BL581, 41BL582a, 41BL827, 41CV722, 41CV1478, 41CV1479, 41CV1480, 41CV1482, and 41CV1549

Taxon	Common Name	NISP
Vertebrata	vertebrates	614
medium vertebrate, class indeterminate	medium vertebrate	1
large vertebrate, class indeterminate	large vertebrate	1
small/medium vertebrata	small/medium-sized vertebrate	21
medium/large vertebrata	medium/large vertebrate	12
Anura	toads and frogs	1
Testudinata	turtles	16
cf. Testudinata	turtles	1
Kinosternidae	mud and musk turtles	1
Colubridae	colubrid snakes	9
Viperidae	pitviper snakes	1
Aves (medium)	medium birds	1
Aves (medium/large)	medium/large birds	4
Aves (large)	large birds	2
Mammalia (micro)	micro-mammal	16
Mammalia (small)	small mammal	8
Mammalia (small/medium)	small/medium-sized mammal	3
Mammalia (medium)	medium-sized mammal	22
Mammalia (medium/large)	medium/large mammal	437
Mammalia (large)	large mammal	85
Mammalia (large/very large)	large/very large mammal	1
Leporidae	rabbits and hares	3
cf. Leporidae	rabbits and hares	1
Lepus californicus	California jackrabbit	1
Sylvilagus sp.	cottontail rabbits	9
cf. *Sylvilagus* sp.	cottontail rabbits	1
Rodentia (small)	small rodent	2
Rodentia (medium)	medium rodent	37
Sciuridae	squirrels and chipmunks	1
Geomys sp.	pocket gophers	2
Castor canadensis	beaver	2
Cricetidae (medium)	medium cricetid rodent	4
Sigmodon hispidus	hispid cotton rat	9
cf. *Sigmodon hispidus*	hispid cotton rat	13
Ondatra zibethicus	muskrat	1
Carnivora	carnivores	2
Mustelidae	weasels and relatives	6
Canis sp.	coyote/wolf/dog	1
Felis rufus	bobcat	3
Odocoileus sp.	deer	38
cf. *Odocoileus* sp.	deer	1
Odocoileus virginianus	white-tailed deer	2
Antilocapra / Odocoileus	pronghorn/deer	35
Bos taurus	cow	1
Bos / bison genus indeterminate	cow/bison	1
Total		1,433

taxa identified are consistent with other archeofaunal studies of Fort Hood assemblages (Baker 1995; Sanchez 1993; Sanchez and Shaffer 1993a, 1993b; Shaffer 1995).

Cultural Taphonomy

Taphonomy is the study of processes that modify and redistribute animal remains from

Table 76. Vertebrate fauna by number of identified specimens

Taxon	41BL155, Subarea B	41BL581	41BL582, Subarea A	41BL827	41CV722	41CV1478	41CV1479	41CV1480	41CV1482	41CV1549	Totals
Vertebrata	71	23	14	87	30	81	206	23	56	23	614
medium vertebrate	–	–	1	–	–	–	–	–	–	–	1
large vertebrate	–	–	–	–	–	–	1	–	–	–	1
small/medium Vertebrata	–	6	6	9	–	–	–	–	–	–	21
medium/large Vertebrata	–	1	–	6	–	2	1	–	–	2	12
Anura	–	–	–	–	–	–	–	–	1	–	1
Testudinata	–	–	–	–	–	3	1	6	6	–	16
cf. Testudinata	–	–	–	–	–	–	–	–	1	–	1
Kinosternidae	–	–	–	–	–	–	–	1	–	–	1
Colubridae	–	–	–	–	–	9	–	–	–	–	9
Viperidae	–	–	–	–	–	1	–	–	–	–	1
Aves (medium)	–	–	1	–	–	–	–	–	–	–	1
Aves (medium/large)	–	–	3	–	–	–	–	–	1	–	4
Aves (large)	–	–	–	–	–	2	–	–	–	–	2
Mammalia (micro)	–	–	16	–	–	–	–	–	–	–	16
Mammalia (small)	–	2	4	–	–	1	1	–	–	–	8
Mammalia (small/medium)	–	–	–	–	–	3	–	–	–	–	3
Mammalia (medium)	–	1	5	1	–	13	–	–	1	1	22
Mammalia (medium/large)	54	12	12	106	55	46	63	3	65	21	437
Mammalia (large)	18	4	1	10	10	8	18	1	9	6	85
Mammalia (large/very large)	–	1	–	–	–	–	–	–	–	–	1
Leporidae	–	2	1	–	–	–	–	–	–	–	3
cf. Leporidae	–	–	1	–	–	–	–	–	–	–	1
Lepus californicus	–	–	–	–	–	–	–	–	1	–	1
Sylvilagus sp.	–	1	2	1	–	4	1	–	–	–	9
cf. *Sylvilagus* sp.	–	–	–	–	–	1	–	–	–	–	1
Rodentia (small)	–	–	2	–	–	–	–	–	–	–	2
Rodentia (medium)	–	–	37	–	–	–	–	–	–	–	37
Sciuridae	–	–	–	–	–	–	1	–	–	–	1
Geomys sp.	–	1	–	–	–	–	–	–	–	1	2
Castor canadensis	–	–	–	–	–	2	–	–	–	–	2
Cricetidae (medium)	–	2	2	–	–	–	–	–	–	–	4
Sigmodon hispidus	–	–	9	–	–	–	–	–	–	–	9
cf. *Sigmodon hispidus*	–	–	13	–	–	–	–	–	–	–	13
Ondatra zibethicus	–	1	–	–	–	–	–	–	–	–	1
Carnivora	–	–	–	1	–	1	–	–	–	–	2
Mustelidae	–	–	1	5	–	–	–	–	–	–	6
Canis sp.	–	–	–	1	–	–	–	–	–	–	1
Felis rufus	–	–	–	3	–	–	–	–	–	–	3
Odocoileus sp.	9	2	1	6	14	1	3	–	1	1	38

Table 76, continued

Taxon	41BL155, Subarea B	41BL581	41BL582, Subarea A	41BL827	41CV722	41CV1478	41CV1479	41CV1480	41CV1482	41CV1549	TotalS
cf. *Odocoileus* sp.	–	–	–	1	–	–	–	–	–	–	1
Odocoileus virginianus	–	1	–	–	–	–	1	–	–	–	2
Antilocapra / Odocoileus	4	–	–	7	9	2	6	–	6	1	35
Bos taurus	–	1	–	–	–	–	–	–	–	–	1
BosBison genus indeterminate	–	–	–	1	–	–	–	–	–	–	1
Totals	156	61	132	245	118	180	303	34	148	56	1,433

the time the animal dies until the remains are collected for study (Efremov 1940; Lyman 1994). Given the limited contextual information on this sample (remains were recovered from archeological testing, not full-scale mitigation), an extensive taphonomic study cannot be undertaken. However, a few observations are warranted.

Cultural taphonomy refers here to those forms of modification that can be linked with human activity. Possible forms of human modification include burning, bone breakage, cut marks, and bone tool construction and use.

Burned Bones

In the past, burned bones were interpreted, without question, as reflecting human activity. More-recent taphonomic scrutiny, however, has shown that burned bones can be recovered from nonarcheological contexts. Thus, burning is not definitive of human behavior (Klein and Cruz-Uribe 1984:6–7; Lyman 1994:388–389). Recent experiments by Bennett and Klippel (1995) have shown that bones can even be burned after burial, if deposited in a rich organic matrix. Burned bones can result from natural forest fires and have even been reported from woodrat nests (Hockett 1989). Context and archeological feature association are among the greatest aids in interpreting burned bones.

Given these limitations, interpretation of the Fort Hood burned bones remains problematic. All 10 sites yielded burned bones; 41BL827 showed the highest frequency, at 32.7 percent (n = 80) of the total sample (Table 77). The burned bone sample consists of 125 unidentified fragments, 2 turtle shell fragments (41CV1480, Lot 15 and 41CV1482, Lot 4), and 95 mammal bones. Given that these remains were recovered from archeological contexts, it is likely that the burning reflects human activity, though this remains an assumption.

Spiral Fractures

Bone breakage patterns also have been examined in the past to determine if humans played a role. Originally, it was believed that spirally fractured bones could result only from human behavior. Broader actualistic studies later showed that spiral fractures can result from a range of activities, including those of humans, carnivores, and animal trampling (Binford 1981; Lyman 1994). Thus, spiral fractures show only that the bone was broken while it retained a relative by high degree of collagen (Johnson 1985). Human consumers typically break bones to extract their marrow and grease or to use them as raw material for making tools or ornaments.

Over 23 percent (n = 334) of the total Fort Hood sample is spirally fractured (see Table 77). Site 41BL827 showed the highest frequency of spirally fractured bones, at 34.7 percent (n = 85). As noted above, this site also yielded the highest frequency of burned bones. Carnivore tooth punctures were identified on several bones in the sample; thus, the exact agent of each spiral fracture remains unclear. It is likely that both human and nonhuman forces contributed to the spiral fractures in the assemblage.

Table 77. Summary of natural and cultural taphonomic data

Site	Site sample size	Lightly weathered #	Lightly weathered %	Spiral fracture #	Spiral fracture %	Burned #	Burned %	Rodent gnawed #	Rodent gnawed %	Pitted #	Pitted %	Cut #	Cut %
41BL155B	156	3	2.0	48	30.8	29	18.6	1	0.6	3	1.9	–	–
41BL581	61	34	55.7	15	24.6	2	3.3	14	23.0	8	13.1	–	–
51BL582A	132	94	71.2	7	5.3	8	6.1	–	–	20	15.2	–	–
51BL827	245	37	15.1	85	34.7	80	32.7	2	0.8	63	25.7	–	–
41CV722	118	–	–	28	23.7	28	23.7	–	–	42	35.6	2	1.7
41CV1478	180	5	2.8	28	15.6	14	7.8	1	0.6	–	–	1	0.6
41CV1479	303	14	4.6	65	21.5	40	13.2	–	–	–	–	1	0.3
41CV1480	34	–	–	–	–	1	2.9	1	2.9	–	–	–	–
41CV1482	148	9	6.1	41	27.7	12	8.1	2	1.4	–	–	–	–
41CV1549	56	2	3.6	17	30.4	8	14.3	2	3.6	6	10.7	–	–
Totals	1,433	198	13.8	334	23.3	222	15.5	23	1.6	142	9.9	4	0.3

Cut Marks

If identified properly, cut marks may provide clearer evidence of modification by humans. Only four definite cut bones were identified in the sample (see Table 77). Two were identified from 41CV722, and one each was noted at 41CV1478 and 41CV1479. One specimen from 41CV722 (Lot 12) is a large mammal rib shaft fragment showing at least eight small cuts along the posterior margin of the rib. The second cut bone from 41CV722 (Lot 60) is a fragment from an indeterminate medium to large mammal that also shows approximately eight small cuts. The cut bone from 41CV1478 (Lot 5) is a left tibiotarsus shaft from a large hawk-sized bird that exhibits a ring-and-snap cut. A fourth bone with cut marks was recovered from 41CV1479 (Lot 37). This rib fragment from a medium/large mammal shows numerous parallel cuts.

Bone Tools

At least two (probably three) bone tools also were identified. A long bone shaft of a medium-sized mammal from 41CV1478 (Lot 18) shows numerous parallel wear striations along the length of the bone. This specimen is broken into 12 fragments. What is commonly referred to as an ulna awl, constructed from a left deer ulna, was recovered from 41CV1479 (Lot 37). In addition, the cut tibiotarsus described above was likely being prepared as a bone tool or ornament. Bone tools are further described under the "Modified Bones" section in Chapter 7.

Natural Taphonomy

Natural taphonomy refers to nonhuman forces that contributed to the accumulation and modification of the bone assemblage. Such taphonomic forces may include, but are not limited to, birds of prey, carnivores, rodent gnawing, rootlet etching, weathering, and ground water dissolution.

Bone Breakage

Overall, the sample is highly fragmented; of the 1,433 specimens analyzed, only 52 (3.6 percent) are complete. The majority of the breaks are dry bone fractures (73.1 percent, n = 1,047), meaning that the breaks occurred after the bone lost the majority of its collagen. Such breakage is commonly associated with postdepositional forces acting on the assemblage.

Weathering and Degradation

The majority of specimens also show heavily degraded and weathered bone surfaces. As indicated in Table 77, only 13.8 percent (n = 198) of the specimens show lightly degraded surfaces. This degradation can result from numerous forces such as repeated wetting and drying, exposure to sunlight, plant rootlet etching, carnivore digestion, bird digestion, water abrasion, and ground water dissolution (Andrews 1990; Fisher 1995). Rootlet etching, sun bleaching, fine-line cracking, and chemical dissolution were all noted in the sample. The exact nature of the degradation often is difficult to assess because numerous factors may act on a single bone and mask other forms of modification. Ground water dissolution (Hedges and Millard 1995) and bone leaching, for example, are common in the limestone settings of Central Texas (Sanchez 1993:45–46) and may be difficult to distinguish from gastrointestinal etching due to carnivore digestion.

Pitting and staining also were noted on many bones in the sample. At least 142 (9.9 percent) of the specimens are pitted (see Table 77); the majority of this pitting was noted at sites 41BL827 and 41CV722. Pits can result from predator digestion or various postdepositional dissolution processes. Only a few examples of staining were noted; these can be attributed to predator digestion (Schmitt and Juell 1994) or postdepositional matrix staining. Sanchez (1993) also noted extensive pitting of bones recovered from Fort Hood; she attributed it to postdepositional processes associated with the limestone substrate and leaching.

Rodent Gnawing

Rodent gnawing was observed on 23 specimens (1.6 percent) in the sample (see Table 77), with the majority of these from 41BL581 (n = 14, 23 percent of that assemblage). This may indicate that the sample from 41BL581 was exposed for a longer period of time prior to burial than the bones from other sites in the sample, allowing for a greater chance of gnawing by rodents. Rodents gnaw bones for their mineral content,

producing easily identifiable parallel tooth mark striations. Specimens that are rodent gnawed are indicated in the "Comments" column of Tables 80 and 81 (due the their length, Tables 80 and 81 follow the text of this appendix).

Carnivore Gnawing

Carnivore gnawing, in the form of tooth punctures, also was noted on two specimens. The first is a left deer femur shaft from 41BL581 (Lot 8). The second is the distal end of a proximal phalanx of a deer from 41BL827 (Lot 35). This shows that at least a portion of the assemblage was modified by carnivores.

Intrusive vs. Cultural Faunas

The human association of faunal assemblages can be difficult to establish. This is especially true of microvertebrate assemblages and rockshelter deposits (Andrews 1990; Stahl 1996). Bone assemblages can accumulate from a range of taphonomic processes.

Faced with similar problems in interpretation, Sanchez (1993) excavated four noncultural rockshelters on Fort Hood, attempting to reconstruct taphonomic signatures for bone assemblages in this area. Only one of these rockshelters, excavated to a depth of 30 cm, yielded a bone assemblage (Rockshelter A; n = 345 specimens) (Sanchez 1993:46). Ninety-eight bones (28 percent) were from opossums that appeared to have lived in the shelter. The broad range of opossum elements was suggestive of natural deaths. Several other taxa, including amphibians, snakes, turkey, rabbits, wood rats, pig, and deer were also identified. No cut marks or burned bones were identified in this assemblage, and only three spirally fractured bones (0.89 percent) were noted. Since no burned bones were identified in any of the noncultural shelters, Sanchez tentatively suggested that burning may be indicative of cultural association in this area.

As Table 77 indicates, burned bones were observed at all 10 sites in the present study, in percentages ranging as high as 32 percent. Much higher spiral fracture frequencies also were noted in the present study than for Sanchez's noncultural shelters. This also may be suggestive of human processing.

Several assemblages or bones in the sample, however, are clearly intrusive. The most obvious is from 41BL582A. This site is dominated by micromammals from Levels 1 and 2 (Lot 8 and Lot 9). These remains also account for the high frequency of lightly weathered bones from this site. These are generally complete elements representing whole animals that do not show the pitting typical of predator digestion (Andrews 1990; Fernandez-Jalvo and Andrews 1992; Rensberger and Krentz 1988; Schmitt and Juell 1994). The microfaunas from these upper levels appear to represent natural deaths. The cow vertebra from Level 1 of 41BL581 (Lot 8) is probably intrusive also, as are the elements showing carnivore gnawing discussed above.

Pathological Bone

Two pathological specimens were identified in the sample. As Baker and Shaffer (1991) and Shaffer and Baker (1996) noted, pathological archeofaunas are rarely reported. Thus, any occurrence contributes to our understanding of the antiquity of animal disease and trauma.

The first specimen is a rat-sized rodent tibiofibula (right) lacking its unfused, proximal epiphysis (41BL582A; Lot 9). This subadult bone shows extensive irregular and pitted reactive bone on the distal end, up to the distal junction with the fibula. The extensive bone growth results in a distal width of 8.8 mm. This bone growth does not appear to be associated with a healed fracture of the tibia, and its etiology remains unclear.

The second specimen is a lumbar vertebra from a medium/large mammal (41CV1478; Lot 3). Unfused centrum epiphyses suggest it is from a subadult. The vertebra shows extensive osteophytosis (lipping) on the anterior centrum face, as well as a thickened left articular facet. Since this is a subadult, it is more likely that the osteophytes resulted from injury or infection than from age-related stress.

Site 41BL581 (Shelter B)

This site is examined in more detail since charcoal recovered at 38–45 cm below the surface produced a radiocarbon age of 10,010 B.P. (see Chapter 5 and Appendix A). Two artifacts, a unifacial scraper and a unifacial thinning flake, were recovered from the lower deposits (ca. below 30–40 cm). Faunal remains associated with this assay have the following lot numbers:

4, 5, 6, 7, and 10. A complete listing of the fauna from this site is presented in Table 81; associated proveniences of the lot numbers are presented in Table 78.

Table 78. Proveniences of lot numbers from 41BL581, Shelter B

1	Test Unit 1, Level 1 (0–10 cm)
2	Test Unit 1, Level 2 (10–20 cm)
3	Test Unit 1, Level 3 (20–30 cm)
4*	Test Unit 1, Level 5 (40–50 cm)
5*	Test Unit 1, Level 6 (50–60 cm)
6*	Test Unit 1, Level 7 (60–70 cm)
7*	Test Unit 1, Level 8 (70–80 cm)
8	Test Unit 2, Level 1 (0–10 cm)
9*	Test Unit 2, Level 2 (10–20 cm)
10*	Test Unit 2, Level 5 (40–50 cm)

*Associated with a radiocarbon age of approximately 10,000 B.P.

The majority (72 percent, n = 44) of the sample was recovered from the upper levels (above 30 cm). Taxa identified from the upper levels include *Sylvilagus* sp. (rabbit), rat-sized cricetid rodent, *Odocoileus virginianus* (deer), *Bos taurus* (domestic cow), and various-sized indeterminate vertebrates (Table 79). Taxa from the lower levels (below 30 cm) include *Geomys* sp. (gopher), rat-sized cricetid rodent, *Ondatra zibethicus* (muskrat), and various sizes of indeterminate vertebrates (see Table 79).

Overall, bone surfaces are relatively well preserved. Fifty-seven percent (n = 25) of the specimens from the upper levels are lightly weathered, while 53 percent (n = 9) from the lower levels are lightly degraded. Fourteen rodent-gnawed bones were noted, all from the upper levels (see "Comments" field for site 41BL581 in Table 81). No bones with calcareous encrustations were noted for Levels 1 or 2, although bones from Levels 3, 5, 7, and 8 of Test Unit 1 do show encrustations. Eight bones with significant pitting were noted, six of which are from the lower levels.

Only two burned bones were noted, both from lower levels. The first is a charred (burned black) rabbit-sized long bone shaft fragment from 50–60 cm (Lot 5). The second is a medium/large mammal fragment from 70–80 cm (Lot 7). As discussed previously, burned bones may result from both human and nonhuman activities. Fifteen spiral-fractured bones were observed, 10 of which were from the upper levels. No cut marks or bone tools were identified.

As previous discussions have emphasized, a clear human association of the faunal remains from the lower deposits at 41BL581 is difficult to assess. No cut marks were observed, while the burned and spiral-fractured bones could have resulted from human or nonhuman forces.

From a biogeographic perspective, the presence of muskrat (*Ondatra zibethicus*) at this site is particularly significant because of the site's great antiquity (approximately 10,000 B.P.). The distal end of a right tibia with calcareous encrustations was recovered from rockshelter sediments 70–80 cm below the surface (Lot 7). The distal breadth of the bone measures 8.4 mm. The identification was verified with comparative materials housed in the Zooarchaeology

Table 79. Taxa recovered from 41BL581, Shelter B

Upper deposits (0–30 cm)	
Vertebrata	19
small/medium vertebrata	3
medium/large vertebrata	1
Mammalia (small)	2
Mammalia (medium/large)	7
Mammalia (large)	3
Mammalia (large/very large)	1
Leporidae	2
Sylvilagus sp.	1
Cricetidae (medium)	1
Odocoileus sp.	2
Odocoileus virginianus	1
Bos taurus	1
Subtotal	44
Lower deposits (30–90 cm)	
Vertebrata	4
small/medium vertebrata	3
Mammalia (medium)	1
Mammalia (medium/large)	5
Mammalia (large)	1
Geomys sp.	1
Cricetidae (medium)	1
Ondatra zibethicus	1
Subtotal	17
Total	61

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Graham and Lundelius (1994) reported only 11 paleontological and archeological sites from Texas yielding the muskrat species *Ondatra zibethicus*. Additional Holocene records were reported from Damp Cave (Val Verde County) and Canyon City Club Cave (Randall County) by Graham (1987:74, 77), but these lacked sufficient radiometric ages to be included in Graham and Lundelius (1994). Wilkins (1992:267, 269) and Lundelius (1967:293) reported two additional Texas records from Moore Pit (Dallas County) and Miller's Cave (Llano County), also not included in Graham and Lundelius (1994). The muskrat is virtually absent in the fossil record of Central Texas, with only two records widely reported (Avenue site and Miller's Cave) (Graham and Lundelius 1994:556; Lundelius 1967:293).

Interestingly, Sanchez and Shaffer (1993a, 1993b) reported nine muskrat elements (MNI = 1) from 41BL671, another rockshelter on Fort Hood. The human occupation of this site spanned the terminal Archaic (A.D. 200–700) and Late Prehistoric (A.D. 700–1700) periods, roughly 1750–250 B.P. (Carlson 1993). Sites 41BL581 and 41BL671 are both located on the north side of Lake Belton, approximately 4–5 km apart. Both shelters are also within 1–2 km of Cowhouse Creek.

Currently, the muskrat does not inhabit Bell or Coryell Counties, although its range does extend to Falls and McLennan Counties to the northeast (Davis and Schmidly 1994:204). It is interesting that both of the Fort Hood records of muskrat come from rockshelters. Muskrats are primarily marsh inhabitants, living in lodges made of marsh vegetation (Davis and Schmidly 1994:205). This suggests that they were deposited in the rockshelter by a predator (either human or nonhuman) and were not living there naturally.

The presence of this mesic riparian species from both late Pleistocene and late Holocene deposits at Fort Hood provides further prehistoric evidence of the species in Central Texas and suggests that its final extirpation from the area likely occurred sometime after 1750 B.P. (based on the artifact chronology of 41BL671). This corresponds closely with the recent paleoenvironmental analysis by Toomey et al. (1993), suggesting a decrease in effective moisture (thus decreasing muskrat habitat) on the eastern Edwards Plateau during the early and middle Holocene and a return to more-moist conditions by ca. 2500 B.P. This was followed by another drying trend beginning roughly 1000 B.P., with modern environments established from 1000 B.P. to the present (Toomey et al. 1993). Continued scrutiny of both cultural and noncultural rockshelter deposits in this area will continue to provide valuable information on the history of the changing distributions of Central Texas faunas.

Table 80. Vertebrate fauna by site and taxon

Site	Taxon	Element	Portion of Element	Side	Comments	Totals
41BL155B	Vertebrata	indeterminate	fragment			
	Mammalia (medium/large)	indeterminate	fragment			71
	Mammalia (medium/large)	long bone	diaphyseal fragment			47
	Mammalia (large)	indeterminate	fragment			7
	Mammalia (large)	long bone	diaphyseal fragment			6
	Odocoileus sp.	mandible	horizontal ramus portion	left	moderate wear; adult	12
	Odocoileus sp.	permanent tooth	cheek tooth			1
	Odocoileus sp.	permanent tooth	lower PM4	left	moderate wear; adult	1
	Odocoileus sp.	permanent tooth	lower M1	left	moderate wear; adult	1
	Odocoileus sp.	permanent tooth	lower M2	left	moderate wear; adult	1
	Odocoileus sp.	permanent tooth	lower M3	left	moderate wear; adult	1
	Odocoileus sp.	tibia	distal end			1
	Odocoileus sp.	tibia	distal medial end	right		1
	Odocoileus sp.	fused 3rd and 4th metacarpal	proximal end	left		1
	Antilocapra / *Odocoileus*	fused 3rd and 4th metatarsal	anterior portion of shaft			1
	Antilocapra / *Odocoileus*	Astragalus	complete or nearly complete	right	rodent gnawed	1
	Antilocapra / *Odocoileus*	metapodial	distal end			1
	Antilocapra / *Odocoileus*	metapodial	distal articular condyle			1
						1
41BL581	Vertebrata	indeterminate	fragment			22
	Vertebrata	indeterminate	fragment		rodent gnawed	1
	Small/medium vertebrata	long bone	diaphyseal fragment			1
	Small/medium vertebrata	long bone	diaphyseal fragment		encrustations	2
	Small/medium vertebrata	long bone	diaphyseal fragment		rabbit-sized	2
	Small/medium vertebrata	long bone	diaphyseal fragment		rodent gnawed	1
	Medium/large vertebrata	indeterminate	fragment		rodent gnawed	1
	Mammalia (small)	cranium	maxilla			1
	Mammalia (small)	rib	complete or nearly complete	right	rabbit-sized	1
	Mammalia (medium)	radius	proximal end	left	skunk-sized	1
	Mammalia (medium/large)	indeterminate	fragment			5
	Mammalia (medium/large)	indeterminate	fragment		encrustations	2
	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	4
	Mammalia (medium/large)	long bone	diaphyseal fragment		encrustations	1
	Mammalia (large)	indeterminate	fragment			1
	Mammalia (large)	indeterminate	fragment		rodent gnawed	2
	Mammalia (large)	long bone	diaphyseal fragment		encrustations	1
	Mammalia (large/very large)	indeterminate	fragment		rodent gnawed; sun bleached	1
	Leporidae	cranium	maxilla	right		1
	Leporidae	femur	distal portion of shaft	right	epiphysis unfused; subadult	1

Table 80, continued

Site	Taxon	Element	Portion of Element	Side	Comments	Total
41BL581, *continued*	*Sylvilagus sp.*	tibia	distal end	left		1
	Geomys sp.	permanent tooth	upper I	right		1
	Cricetidae (medium)	femur	proximal end	right		1
	Cricetidae (medium)	femur	proximal portion of shaft	right	stained	1
	Ondatra zibethicus	tibia	distal end	right	encrustations; DB = 8.4 mm	1
	Odocoileus sp.	fused 3rd and 4th metacarpal	distal anterior part of shaft		rodent gnawed	1
	Odocoileus sp.	fused 3rd and 4th metatarsal	proximal portion of shaft	right	rodent gnawed	1
	Odocoileus virginianus	femur	diaphyseal fragment	left	rodent gnawed; punctures	1
	Bos taurus	thoracic vertebra	complete minus spinous process	axial	rodent gnawed; fine-line cracking	1
41BL582A	Vertebrata	indeterminate	fragment			14
	Medium vertebrate, class ind.	humerus	diaphyseal fragment	left	subadult (size)	1
	Small/medium vertebrata	vertebra	fragment	axial		1
	Small/medium vertebrata	long bone	diaphyseal fragment			4
	Small/medium vertebrata	long bone	diaphyseal fragment		stained	1
	Aves (medium)	tarsometatarsus	complete or nearly complete	right	L = 32.1; Bd = 5.5 mm	1
	Aves (medium/large)	femur	proximal portion of shaft	left	epiphysis unfused; subadult	2
	Aves (medium/large)	femur	complete shaft	right	epiphyses unfused; subadult	1
	Mammalia (micro)	cranium	fragment			3
	Mammalia (micro)	vertebra	complete or nearly complete	axial		8
	Mammalia (micro)	vertebra	fragment	axial		2
	Mammalia (micro)	sacrum	complete or nearly complete	axial		1
	Mammalia (micro)	scapula	glenoid fossa and incomplete blade	right		2
	Mammalia (small)	cranium	petrosal			1
	Mammalia (small)	scapula	glenoid fossa and incomplete blade	right	epiphysis unfused; subadult	1
	Mammalia (small)	radius	diaphyseal fragment			1
	Mammalia (small)	pelvis	Ischium complete	left	epiphysis unfused; subadult	1
	Mammalia (medium)	humerus	distal portion of shaft	left	epiphysis unfused; subadult	1
	Mammalia (medium)	femur	complete shaft	right	epiphyses unfused; subadult	1
	Mammalia (medium)	tibia	proximal end	right	epiphysis unfused; subadult	1
	Mammalia (medium)	tibia	proximal portion of shaft	right	stained; subadult (size)	1
	Mammalia (medium)	tibia	complete shaft	left	epiphyses unfused; subadult	1
	Mammalia (medium/large)	indeterminate	fragment			8
	Mammalia (medium/large)	indeterminate	fragment		encrustations	3
	Mammalia (medium/large)	long bone	diaphyseal fragment		encrustations	1
	Mammalia (large)	long bone	diaphyseal fragment		encrustations	1
	Leporidae	tibia	fibular scar		encrustations	1
	cf. Leporidae	metapodial	complete minus distal epiphysis		epiphysis unfused; subadult	1
	Sylvilagus sp.	pelvis	acetabulum with ischium and pubis	left		1
	Sylvilagus sp.	metatarsal 2	complete or nearly complete	left		1
	Rodentia (small)	humerus	complete minus proximal epiphysis	left	epiphysis unfused; subadult	1

Table 80, continued

Site	Taxon	Element	Portion of Element	Side	Comments	Total
41BL582A, *continued*	Rodentia (small)	humerus	complete minus proximal epiphysis	right	epiphysis unfused; subadult	1
	Rodentia (medium)	pelvis	acetabulum w/ilium, ischium, pubis	left		8
	Rodentia (medium)	pelvis	acetabulum w/ilium, ischium, pubis	right		7
	Rodentia (medium)	pelvis	acetabulum with ischium and pubis	left		1
	Rodentia (medium)	pelvis	ilium fragment			1
	Rodentia (medium)	pelvis	ilium fragment	left	epiphysis unfused; subadult	1
	Rodentia (medium)	femur	complete minus distal epiphysis	left	distal unfused; subadult	1
	Rodentia (medium)	femur	proximal portion of shaft	left	epiphysis unfused; subadult	1
	Rodentia (medium)	femur	proximal portion of shaft	right	epiphysis unfused; subadult	2
	Rodentia (medium)	femur	complete shaft	left	epiphyses unfused; subadult	4
	Rodentia (medium)	femur	complete shaft	right	epiphyses unfused; subadult	1
	Rodentia (medium)	tibia	complete or nearly complete	right		1
	Rodentia (medium)	tibia	complete minus proximal epiphysis	left	epiphysis unfused; subadult	3
	Rodentia (medium)	tibia	complete minus proximal epiphysis	right	distal exotosis; W = 8.8 mm; subadult	1
	Rodentia (medium)	tibia	complete minus proximal epiphysis	right	epiphysis unfused; subadult	2
	Rodentia (medium)	tibia	proximal portion of shaft	left	epiphysis unfused; subadult	1
	Rodentia (medium)	tibia	distal end	right		2
	Cricetidae (medium)	pelvis	acetabulum w/ilium, ischium, pubis	left		1
	Cricetidae (medium)	femur	complete shaft	right	epiphysis unfused; subadult	1
	Signodon hispidus	cranium	maxilla	left	with M1–M3	2
	Signodon hispidus	mandible	ramus complete	left	with M1–M2	1
	Signodon hispidus	mandible	horizontal ramus w/incisor alveolus	left	with I and M1	1
	Signodon hispidus	mandible	horizontal ramus w/incisor alveolus	left	with I and M1–M2	1
	Signodon hispidus	mandible	horizontal ramus w/incisor alveolus	left	M1–M3; small stained pits	1
	Signodon hispidus	mandible	horizontal ramus w/incisor alveolus	right	with I and M1–M2	2
	Signodon hispidus	mandible	horizontal ramus portion	right	with M1–M2	1
	cf. *Signodon hispidus*	permanent tooth	lower I	right		1
	cf. *Signodon hispidus*	femur	complete or nearly complete	left		2
	cf. *Signodon hispidus*	femur	proximal end	left	epiphysis unfused; subadult	1
	cf. *Signodon hispidus*	femur	proximal end	right	stained; epiphysis unfused; subadult	1
	cf. *Signodon hispidus*	femur	complete shaft	left	epiphyses unfused; subadult	2
	cf. *Signodon hispidus*	femur	complete shaft	right	epiphyses unfused; subadult	3
	cf. *Signodon hispidus*	tibia	complete or nearly complete	left	rootlet etching	1
	cf. *Signodon hispidus*	tibia	complete minus proximal epiphysis	right	epiphysis unfused; subadult	2
	Mustelidae	permanent tooth	upper MI	left	slight/no wear; subadult	1
	Odocoileus sp.	antler	fragment			1
41CV722	Vertebrata	indeterminate	fragment			30
	Mammalia (medium/large)	indeterminate	fragment			52
	Mammalia (medium/large)	indeterminate	fragment		approximately 8 cut marks	1

Table 80, continued

Site	Taxon	Element	Portion of Element	Side	Comments	Total
41CV722, *continued*	Mammalia (medium/large)	long bone	diaphyseal fragment			2
	Mammalia (large)	indeterminate	fragment			1
	Mammalia (large)	alveolar ridge fragment	fragment			1
	Mammalia (large)	vertebra	centrum	axial		1
	Mammalia (large)	rib	shaft fragment		8+ cut marks	1
	Mammalia (large)	long bone	diaphyseal fragment			6
	Odocoileus sp.	alveolar ridge fragment	fragment			1
	Odocoileus sp.	permanent tooth	upper PM2	right	moderate wear; adult	1
	Odocoileus sp.	permanent tooth	upper PM3	right	moderate wear; adult	1
	Odocoileus sp.	permanent tooth	upper PM4	right	moderate wear; adult	1
	Odocoileus sp.	permanent tooth	upper M1	right	moderate wear; adult	1
	Odocoileus sp.	permanent tooth	upper M2	right	moderate wear; adult	1
	Odocoileus sp.	permanent tooth	lower M3	right		1
	Odocoileus sp.	radius	distal end	left		1
	Odocoileus sp.	tibia	proximal end	right		1
	Odocoileus sp.	tibia	distal end	right		1
	Odocoileus sp.	middle phalange	proximal end			1
	Odocoileus sp.	distal phalange	proximal end			1
	Odocoileus sp.	distal phalange of paradigit	complete or nearly complete			1
	Odocoileus sp.	fused central/fourth tarsal	complete or nearly complete	left		1
	Antilocapra / Odocoileus	cranium	petrosal			1
	Antilocapra / Odocoileus	mandible	horizontal ramus fragment	right		1
	Antilocapra / Odocoileus	axis	odontoid process	axial		1
	Antilocapra / Odocoileus	radius	proximal lateral end	right		1
	Antilocapra / Odocoileus	radius	proximal medial end	right		1
	Antilocapra / Odocoileus	patella	fragment			1
	Antilocapra / Odocoileus	metapodial	posterior portion of shaft			1
	Antilocapra / Odocoileus	metatarsal	anterior portion of shaft			2
41BL827	Vertebrata	indeterminate	fragment			87
	Small/medium vertebrata	rib	shaft fragment			1
	Small/medium vertebrata	rib	shaft fragment	right	dissolution	1
	Small/medium vertebrata	long bone	diaphyseal fragment			7
	Medium/large vertebrata	indeterminate	fragment			1
	Medium/large vertebrata	long bone	diaphyseal fragment			5
	Mammalia (medium)	middle phalange	complete or nearly complete			1
	Mammalia (medium/large)	indeterminate	fragment			90
	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	Mammalia (medium/large)	alveolar ridge fragment	fragment			1
	Mammalia (medium/large)	caudal vertebra	complete or nearly complete	axial		1
	Mammalia (medium/large)	rib	shaft fragment			2
	Mammalia (medium/large)	long bone	diaphyseal fragment			11

Table 80, continued

Site	Taxon	Element	Portion of Element	Side	Comments	Total
41BL827, *continued*	Mammalia (large)	indeterminate	fragment			2
	Mammalia (large)	indeterminate	fragment		rodent gnawed	1
	Mammalia (large)	cranium	petrosal			1
	Mammalia (large)	long bone	diaphyseal fragment			6
	Sylvilagus sp.	metatarsal 4	proximal end	right		1
	Carnivora	metapodial	distal end			1
	Mustelidae	mandible	horizontal ramus portion	right		1
	Mustelidae	permanent tooth	lower C	right		1
	Mustelidae	permanent tooth	lower PM3	right		1
	Mustelidae	permanent tooth	lower PM4	right		1
	Mustelidae	permanent tooth	lower M1	right		1
	Canis sp.	permanent tooth	upper C	left		1
	Felis rufus	mandible	horizontal ramus portion	right		1
	Felis rufus	permanent tooth	lower PM3	right		1
	Felis rufus	permanent tooth	lower PM4	right		1
	Odocoileus sp.	fused 3rd and 4th metatarsal	proximal anterior part of shaft	left		1
	Odocoileus sp.	proximal phalange	distal end		puncture	1
	Odocoileus sp.	middle phalange	distal end			1
	Odocoileus sp.	distal phalange	complete or nearly complete			3
	cf. *Odocoileus* sp.	tibia	proximal posterior medial end	left		1
	Antilocapra / Odocoileus	axis	fragment	axial		1
	Antilocapra / Odocoileus	fused 3rd and 4th metatarsal	anterior portion of shaft			1
	Antilocapra / Odocoileus	proximal phalange	distal end			2
	Antilocapra / Odocoileus	middle phalange	proximal posterior end			1
	Antilocapra / Odocoileus	middle phalange	distal anterior end			1
	Antilocapra / Odocoileus	fused 2nd and 3rd tarsal	complete or nearly complete	left		1
	Bos / Bison genus indeterminate	permanent tooth	cheek tooth			1
41CV1478	Vertebrata	indeterminate	fragment			81
	Medium/large vertebrata	indeterminate	fragment			1
	Medium/large vertebrata	long bone	diaphyseal			1
	Testudinata	shell fragment	fragment			1
	Testudinata	shell fragment	fragment			2
	Colubridae	dorsal vertebra	complete or nearly complete	axial		9
	Viperidae	dorsal vertebra	complete or nearly complete	axial		1
	Aves (large)	long bone	diaphyseal fragment			1
	Aves (large)	tibiotarsus	diaphyseal fragment	left	cat# 1-1478-005-1; ring & snap; L = 119.8 mm	1
	Mammalia (small)	radius	proximal end	left		1
	Mammalia (small/medium)	alveolar ridge fragment	fragment			3
	Mammalia (medium)	proximal phalange	distal end			1

Table 80, continued

Site	Taxon	Element	Portion of Element	Side	Comments	Total
41CV1478, *continued*	Mammalia (medium)	long bone	diaphyseal fragment		longitudinal, parallel striations	12
	Mammalia (medium/large)	indeterminate	fragment			41
	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	Mammalia (medium/large)	lumbar vertebra	complete or nearly complete	axial	pathological;unfused;subadult	1
	Mammalia (medium/large)	rib	vertebral end			1
	Mammalia (medium/large)	costal cartilage	fragment			1
	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	Mammalia (large)	indeterminate	fragment			4
	Mammalia (large)	long bone	diaphyseal fragment			4
	Sylvilagus sp.	mandible	incisor and diastema area only	right	with incisor	1
	Sylvilagus sp.	astragalus	fragment	right		1
	Sylvilagus sp.	calcaneus	complete or nearly complete	left		2
	cf. *Sylvilagus* sp.	pelvis	ischium fragment	left		1
	Castor canadensis	permanent tooth	lower M1 or M2	right		1
	Castor canadensis	tooth, permanent/decid. ind.	enamel fragment			1
	Carnivora	astragalus	complete or nearly complete	left		1
	Odocoileus sp.	distal phalange	complete or nearly complete			1
	Antilocapra / Odocoileus	axis	odontoid process	axial		1
	Antilocapra / Odocoileus	middle phalange	distal end			1
41CV1479	Vertebrata	indeterminate	fragment			205
	Vertebrata	mandible	horizontal ramus fragment	left		1
	Large vertebrate, class ind.	phalange	distal end			1
	Medium/large vertebrata	long bone	diaphyseal fragment			1
	Testudinata	neural	complete or nearly complete	axial		1
	Mammalia (small)	sacrum	sacral element	axial		1
	Mammalia (medium/large)	indeterminate	fragment			54
	Mammalia (medium/large)	cranium	fragment			2
	Mammalia (medium/large)	permanent tooth	incisor			1
	Mammalia (medium/large)	tooth, permanent/dicid. ind.	root fragment			1
	Mammalia (medium/large)	vertebra	articular facet	axial		1
	Mammalia (medium/large)	rib	shaft fragment			1
	Mammalia (medium/large)	rib	shaft fragment		numerous parallel cuts	1
	Mammalia (medium/large)	long bone	diaphyseal fragment			2
	Mammalia (large)	indeterminate	fragment			7
	Mammalia (large)	vertebra	fragment	axial		1
	Mammalia (large)	rib	vertebral end	right		1
	Mammalia (large)	long bone	diaphyseal fragment			9
	Sylvilagus sp.	mandible	horizontal ramus w/incisor alveolus	right		1
	Sciuridae	femur	proximal end	right		1
	Odocoileus sp.	ulna	semi-lunar notch only	left	ulna awl	1

Table 80, continued

Site	Taxon	Element	Portion of Element	Side	Comments	Total
41CV1479, *continued*	*Odocoileus* sp.	proximal phalange	proximal end			1
	Odocoileus sp.	antler	fragment			1
	Odocoileus virginianus	intermediate carpal bone	complete or nearly complete	left		1
	Antilocapra / Odocoileus	cranium	premaxilla	right		1
	Antilocapra / Odocoileus	axis	odontoid process	axial		1
	Antilocapra / Odocoileus	metapodial	distal articular condyle			1
	Antilocapra / Odocoileus	fused 3rd and 4th metatarsal	proximal anterior end	right		1
	Antilocapra / Odocoileus	fused 3rd and 4th metatarsal	proximal posterior end	right		1
	Antilocapra / Odocoileus	fused 2nd and 3rd tarsal	complete or nearly complete	right		1
41CV1480	Vertebrata	indeterminate	fragment			22
	Vertebrata	indeterminate	fragment		rodent gnawed	1
	Testudinata	shell fragment	fragment			6
	Kinosternidae	peripheral	complete or nearly complete			1
	Mammalia (medium/large)	indeterminate	fragment			2
	Mammalia (medium/large)	rib	shaft fragment			1
	Mammalia (large)	rib	vertebral end	right		1
41CV1482	Vertebrata	indeterminate	fragment			56
	Anura	pelvis	ilium complete			1
	Testudinata	shell fragment	fragment			3
	Testudinata	shell fragment	fragment			2
	Testudinata	peripheral	fragment			1
	cf. Testudinata	distal phalange	complete or nearly complete			1
	Aves (medium/large)	coracoid	proximal portion of shaft	left		1
	Mammalia (medium)	radius	diaphyseal fragment			1
	Mammalia (medium/large)	indeterminate	fragment			45
	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	2
	Mammalia (medium/large)	cranium	fragment			3
	Mammalia (medium/large)	alveolar ridge fragment	fragment	right		1
	Mammalia (medium/large)	tooth, permanent/decid. ind.	root fragment			1
	Mammalia (medium/large)	rib	vertebral end			1
	Mammalia (medium/large)	rib	shaft fragment	left		7
	Mammalia (medium/large)	long bone	diaphyseal fragment			5
	Mammalia (large)	scapula	glenoid fossa and incomplete blade	left		1
	Mammalia (large)	long bone	diaphyseal fragment	left		8
	Lepus californicus	humerus	distal end	left		1
	Odocoileus sp.	permanent tooth	lower I		epiphysis unfused; subadult	1
	Antilocapra / Odocoileus	radius	proximal lateral end		epiphysis unfused; subadult	1
	Antilocapra / Odocoileus	metapodial	distal articular condyle			1
	Antilocapra / Odocoileus	proximal phalange	anterior portion of shaft			1
	Antilocapra / Odocoileus	proximal phalange	distal anterior end			1
	Antilocapra / Odocoileus	middle phalange	distal anterior end			2

Table 80, continued

Site	Taxon	Element	Portion of Element	Side	Comments	Total
41CV1549	Vertebrata	indeterminate	fragment			23
	Medium/large vertebrata	long bone	diaphyseal fragment			1
	Medium/large vertebrata	long bone	diaphyseal fragment		rodent gnawed	1
	Mammalia (medium)	radius	diaphyseal fragment			1
	Mammalia (medium/large)	indeterminate	fragment			14
	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	Mammalia (medium/large)	cranium	fragment			4
	Mammalia (medium/large)	rib	shaft fragment			1
	Mammalia (medium/large)	humerus	distal end	left	rootlet etching	1
	Mammalia (large)	long bone	diaphyseal fragment			6
	Geomys sp.	mandible	horizontal ramus w/incisor alveolus	left	with PM4–M2	1
	Odocoileus sp.	permanent tooth	cheek tooth			1
	Antilocapra / Odocoileus	proximal phalange	distal posterior end			1
TOTAL						1433

Table 81. Vertebrate fauna by site and lot number

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41BL155,	27	Vertebrata	indeterminate	fragment			1
Subarea B	28	Vertebrata	indeterminate	fragment			8
	28	Mammalia (medium/large)	indeterminate	fragment			3
	28	Mammalia (large)	long bone	diaphyseal fragment			3
	29	Vertebrata	indeterminate	fragment			30
	29	Mammalia (medium/large)	indeterminate	fragment			19
	29	Mammalia (large)	long bone	diaphyseal fragment			3
	29	*Odocoileus* sp.	tibia	distal medial end	right		1
	30	Vertebrata	indeterminate	fragment			1
	30	Mammalia (medium/large)	indeterminate	fragment			2
	30	Mammalia (large)	indeterminate	fragment			5
	30	Mammalia (large)	long bone	diaphyseal fragment			5
	30	*Odocoileus* sp.	tibia	distal end			1
	30	*Antilocapra / Odocoileus*	fused 3rd and 4th metatarsal	anterior portion of shaft			1
	31	Vertebrata	indeterminate	fragment			3
	31	Mammalia (medium/large)	indeterminate	fragment			3
	31	Mammalia (large)	indeterminate	fragment			1
	31	*Antilocapra / Odocoileus*	metapodial	distal end			1
	31	*Antilocapra / Odocoileus*	metapodial	distal articular condyle			1
	32	Mammalia (medium/large)	long bone	diaphyseal fragment			3
	32	*Odocoileus* sp.	fused 3rd and 4th metacarpal	proximal end	left		1
	33	Vertebrata	indeterminate	fragment			1
	43	Vertebrata	indeterminate	fragment			8
	44	Vertebrata	indeterminate	fragment			8
	44	Mammalia (medium/large)	indeterminate	fragment			7
	44	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	44	*Odocoileus* sp.	permanent tooth	cheek tooth			1
	45	Vertebrata	indeterminate	fragment			2
	45	Mammalia (medium/large)	indeterminate	fragment			4
	45	Mammalia (large)	long bone	diaphyseal fragment			1
	45	*Odocoileus* sp.	mandible	horizontal ramus portion	left	moderate wear; adult	1
	45	*Odocoileus* sp.	permanent tooth	lower PM4	left	mderate wear; adult	1
	45	*Odocoileus* sp.	permanent tooth	lower M1	left	moderate wear; adult	1
	45	*Odocoileus* sp.	permanent tooth	lower M2	left	moderate wear; adult	1
	45	*Odocoileus* sp.	permanent tooth	lower M3	left	moderate wear; adult	1
	45	*Antilocapra / Odocoileus*	Astragalus	complete or nearly complete	right	rodent gnawed	1
	46	Vertebrata	indeterminate	fragment			4
	46	Mammalia (medium/large)	indeterminate	fragment			1
	46	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	47	Vertebrata	indeterminate	fragment			1
	48	Mammalia (medium/large)	indeterminate	fragment			3
	58	Vertebrata	indeterminate	fragment			3
	63	Mammalia (medium/large)	indeterminate	fragment			1
	64	Mammalia (medium/large)	indeterminate	fragment			3
	66	Vertebrata	indeterminate	fragment			1
	67	Mammalia (medium/large)	indeterminate	fragment			1
	70	Mammalia (medium/large)	long bone	diaphyseal fragment			2

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41BL581	1	Vertebrata	indeterminate	fragment			2
	1	Vertebrata	indeterminate	fragment		rodent gnawed	1
	1	Mammalia (small)	rib	complete or nearly complete	right	rabbit-sized	1
	1	Mammalia (medium/large)	indeterminate	fragment			1
	1	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	2
	1	Leporidae	femur	distal portion of shaft	right	epiphysis unfused; subadult	1
	2	Vertebrata	indeterminate	fragment			1
	2	Small/medium vertebrata	long bone	diaphyseal fragment			1
	2	Medium/large vertebrata	indeterminate	fragment		rodent gnawed	1
	2	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	2	*Odocoileus* sp.	fused 3rd and 4th metacarpal	distal anterior part of shaft		rodent gnawed	1
	2	*Odocoileus* sp.	fused 3rd and 4th metatarsal	proximal portion of shaft	right	rodent gnawed	1
	3	Small/medium vertebrata	long bone	diaphyseal fragment		encrustations	1
	4	Mammalia (medium/large)	long bone	diaphyseal fragment		encrustations	1
	4	*Geomys* sp.	permanent tooth	upper I	right		1
	5	Vertebrata	indeterminate	fragment			3
	5	Small/medium vertebrata	long bone	diaphyseal fragment		rabbit-sized	2
	5	Mammalia (medium)	Radius	proximal end	left	skunk-sized	1
	5	Cricetidae (medium)	femur	proximal end	right		1
	6	Vertebrata	indeterminate	fragment			1
	6	Mammalia (medium/large)	indeterminate	fragment		encrustations	2
	6	Mammalia (large)	long bone	diaphyseal fragment		encrustations	1
	7	Mammalia (medium/large)	indeterminate	fragment			2
	7	*Ondatra zibethicus*	tibia	distal end	right	encrustations;DB = 8.4 mm	1
	8	Mammalia (medium/large)	indeterminate	fragment			1
	8	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	8	Mammalia (large)	indeterminate	fragment		rodent gnawed	2
	8	Mammalia (large/very large)	indeterminate	fragment		rodent gnawed;sun bleached	1
	8	*Sylvilagus* sp.	tibia	distal end	left		1
	8	*Odocoileus virginianus*	femur	diaphyseal fragment	left	rodent gnawed; punctures	1
	8	*Bos taurus*	thoracic vertebra	complete minus spinous process	axial	rodent gnawed;fine-line cracks	1
	9	Vertebrata	indeterminate	fragment			15
	9	Small/medium vertebrata	long bone	diaphyseal fragment		rodent gnawed	1
	9	Mammalia (small)	cranium	maxilla			1
	9	Mammalia (medium/large)	indeterminate	fragment			1
	9	Mammalia (large)	indeterminate	fragment			1
	9	Leporidae	cranium	maxilla	right		1
	9	Cricetidae (medium)	femur	proximal portion of shaft	right	stained	1
	10	Small/medium vertebrata	long bone	diaphyseal fragment		encrustations	1
41BL582, Subarea A	8	Vertebrata	indeterminate	fragment			3
	8	Small/medium vertebrata	long bone	diaphyseal fragment			2
	8	Aves (medium)	tarsometatarsus	complete or nearly complete	right	L= 32.1; BD = 5.5 mm	1
	8	Aves (medium/large)	femur	proximal portion of shaft	left	epiphysis unfused; subadult	2
	8	Aves (medium/large)	femur	complete shaft	right	epiphyses unfused; subadult	1
	8	Mammalia (micro)	cranium	fragment			3
	8	Mammalia (micro)	vertebra	complete or nearly complete	axial		7
	8	Mammalia (micro)	scapula	glenoid fossa & incomplete blade	right		1
	8	Mammalia (small)	cranium	petrosal			1
	8	Mammalia (small)	scapula	glenoid fossa & incomplete blade	right	epiphysis unfused; subadult	1
	8	Mammalia (small)	radius	diaphyseal fragment			1
	8	Mammalia (small)	pelvis	ischium complete	left	epiphysis unfused; subadult	1

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41BL582,	8	cf. Leporidae	metapodial	complete minus distal epiphysis		epiphysis unfused; subadult	1
Subarea A	8	*Sylvilagus* sp.	pelvis	acetabulum with ischium & pubis	left		1
continued	8	*Sylvilagus* sp.	metatarsal 2	complete or nearly complete	left		1
	8	Rodentia (small)	humerus	complete minus proximal epiphysis	left	epiphysis unfused; subadult	1
	8	Rodentia (small)	humerus	complete minus proximal epiphysis	right	epiphysis unfused; subadult	1
	8	Rodentia (medium)	pelvis	acetabulum w/ilium,ischium,pubis	left		7
	8	Rodentia (medium)	pelvis	acetabulum w/ilium,ischium,pubis	right		3
	8	Rodentia (medium)	pelvis	acetabulum with ischium & pubis	left		1
	8	Rodentia (medium)	pelvis	ilium fragment			1
	8	Rodentia (medium)	pelvis	ilium fragment	left	epiphysis unfused; subadult	1
	8	Rodentia (medium)	femur	complete minus distal epiphysis	left	distal unfused; subadult	1
	8	Rodentia (medium)	femur	proximal portion of shaft	left	epiphysis unfused; subadult	1
	8	Rodentia (medium)	femur	proximal portion of shaft	right	epiphysis unfused; subadult	2
	8	Rodentia (medium)	femur	complete shaft	left	epiphyses unfused; subadult	4
	8	Rodentia (medium)	femur	complete shaft	right	epiphyses unfused; subadult	1
	8	Rodentia (medium)	tibia	complete or nearly complete	right		1
	8	Rodentia (medium)	tibia	complete minus proximal epiphysis	left	epiphysis unfused; subadult	3
	8	Rodentia (medium)	tibia	complete minus proximal epiphysis	right	epiphysis unfused; subadult	2
	8	Rodentia (medium)	tibia	proximal portion of shaft	left	epiphysis unfused; subadult	1
	8	Rodentia (medium)	tibia	distal end	right		2
	8	*Sigmodon hispidus*	cranium	maxilla	left	with M1–M3	1
	8	*Sigmodon hispidus*	mandible	horizontal ramus w/incisor alveolus	left	M1–M3;small stained pits	1
	8	cf. *Sigmodon hispidus*	femur	complete or nearly complete	left		2
	8	cf. *Sigmodon hispidus*	femur	complete shaft	left	epiphyses unfused; subadult	1
	8	Mustelidae	permanent tooth	upper M1	left	slight/no wear; subadult	1
	8	*Odocoileus* sp.	antler	fragment			1
	9	Vertebrata	indeterminate	fragment			3
	9	Medium vertebrate/class ind.	humerus	diaphyseal fragment	left	subadult (size)	1
	9	Small/medium vertebrata	vertebra	fragment	axial		1
	9	Small/medium vertebrata	long bone	diaphyseal fragment			1
	9	Small/medium vertebrata	long bone	diaphyseal fragment		stained	1
	9	Mammalia (micro)	vertebra	complete or nearly complete	axial		1
	9	Mammalia (micro)	vertebra	fragment	axial		2
	9	Mammalia (micro)	Sacrum	complete or nearly complete	axial		1
	9	Mammalia (micro)	scapula	glenoid fossa & incomplete blade	right		1
	9	Mammalia (medium)	humerus	distal portion of shaft	left	epiphysis unfused; subadult	1
	9	Mammalia (medium)	femur	complete shaft	right	epiphyses unfused; subadult	1
	9	Mammalia (medium)	tibia	proximal end	right	epiphysis unfused; subadult	1
	9	Mammalia (medium)	tibia	proximal portion of shaft	right	stained; subadult (size)	1
	9	Mammalia (medium)	tibia	complete shaft	left	epiphyses unfused; subadult	1
	9	Mammalia (medium/large)	indeterminate	fragment			3
	9	Mammalia (medium/large)	indeterminate	fragment		encrustations	1
	9	Rodentia (medium)	pelvis	acetabulum w/ilium,ischium,pubis	left		1
	9	Rodentia (medium)	pelvis	acetabulum w/ilium,ischium,pubis	right		4
	9	Rodentia (medium)	tibia	complete minus proximal epiphysis	right	exostosis;W=8.8mm;subadult	1
	9	*Sigmodon hispidus*	cranium	maxilla	left	with M1–M3	1
	9	*Sigmodon hispidus*	mandible	ramus complete	left	with M1–M2	1
	9	*Sigmodon hispidus*	mandible	horizontal ramus w/incisor alveolus	left	with I and M1	1
	9	*Sigmodon hispidus*	mandible	horizontal ramus w/incisor alveolus	left	with I and M1–M2	1

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41BL582, Subarea A, *continued*	9	*Sigmodon hispidus*	mandible	horizontal ramus w/incisor alveolus	right	with I and M1–M2	2
	9	*Sigmodon hispidus*	mandible	horizontal ramus portion	right	with M1–M2	1
	9	cf. *Sigmodon hispidus*	permanent tooth	lower I	right		1
	9	cf. *Sigmodon hispidus*	femur	proximal end	left	epiphysis unfused; subadult	1
	9	cf. *Sigmodon hispidus*	femur	proximal end	right	stained; unfused; subadult	1
	9	cf. *Sigmodon hispidus*	femur	complete shaft	left	epiphyses unfused; subadult	1
	9	cf. *Sigmodon hispidus*	femur	complete shaft	right	epiphyses unfused; subadult	3
	9	cf. *Sigmodon hispidus*	tibia	complete or nearly complete	left	rootlet etching	1
	9	cf. *Sigmodon hispidus*	tibia	complete minus proximal epiphysis	right	epiphysis unfused; subadult	2
	10	Vertebrata	indeterminate	fragment			1
	10	Mammalia (medium/large)	indeterminate	fragment			3
	10	Cricetidae (medium)	femur	complete shaft	right	epiphyses unfused; subadult	1
	11	Vertebrata	indeterminate	fragment			7
	11	Mammalia (large)	long bone	diaphyseal fragment		encrustations	1
	11	Cricetidae (medium)	pelvis	acetabulum w/ilium,ischium,pubis	left		1
	14	Mammalia (medium/large)	indeterminate	fragment			1
	17	Small/medium vertebrata	long bone	diaphyseal fragment			1
	17	Mammalia (medium/large)	indeterminate	fragment			1
	17	Mammalia (medium/large)	indeterminate	fragment		encrustations	2
	18	Mammalia (medium/large)	long bone	diaphyseal fragment		encrustations	1
	18	Leporidae	tibia	fibular scar		encrustations	1
41BL827	26	Vertebrata	indeterminate	fragment			3
	26	Small/medium vertebrata	rib	shaft fragment			1
	26	Small/medium vertebrata	rib	shaft fragment	right	dissolution	1
	26	Mammalia (medium)	middle phalange	complete or nearly complete			1
	26	Mammalia (medium/large)	indeterminate	fragment			2
	26	*Canis* sp.	permanent tooth	upper C	left		1
	27	Vertebrata	indeterminate	fragment			7
	27	Mammalia (medium/large)	indeterminate	fragment			3
	27	Mammalia (large)	indeterminate	fragment			1
	27	Mammalia (large)	long bone	diaphyseal fragment			3
	27	*Odocoileus* sp.	middle phalange	distal end			1
	28	Mammalia (medium/large)	indeterminate	fragment			4
	28	Mammalia (large)	long bone	diaphyseal fragment			1
	30	Vertebrata	indeterminate	fragment			1
	30	Mammalia (medium/large)	indeterminate	fragment			1
	30	Mammalia (large)	long bone	diaphyseal fragment			1
	30	*Odocoileus* sp.	fused 3rd and 4th metatarsal	proximal anterior part of shaft	left		1
	31	Mammalia (medium/large)	indeterminate	fragment			3
	31	Mammalia (large)	indeterminate	fragment		rodent gnawed	1
	32	Vertebrata	indeterminate	fragment			2
	35	Vertebrata	indeterminate	fragment			7
	35	Medium/large vertebrata	long bone	diaphyseal fragment			1
	35	Mammalia (medium/large)	indeterminate	fragment			2
	35	Mammalia (medium/large)	caudal vertebra	complete or nearly complete	axial		1
	35	*Odocoileus* sp.	proximal phalange	distal end		puncture	1
	36	Vertebrata	indeterminate	fragment			17
	36	Mammalia (medium/large)	indeterminate	fragment			15
	36	Mammalia (medium/large)	alveolar ridge fragment	fragment			1
	36	Mammalia (medium/large)	rib	shaft fragment			2
	36	Mammalia (medium/large)	long bone	diaphyseal fragment			5

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41BL827, *continued*	36	*Odocoileus* sp.	distal phalange	complete or nearly complete			2
	36	*Antilocapra / Odocoileus*	middle phalange	proximal posterior end			1
	36	*Antilocapra / Odocoileus*	middle phalange	distal anterior end			1
	36	*Bos / Bison* genus indeterm.	permanent tooth	cheek tooth			1
	37	Vertebrata	indeterminate	fragment			20
	37	Small/medium vertebrata	long bone	diaphyseal fragment			2
	37	Mammalia (medium/large)	indeterminate	fragment			28
	37	Mammalia (medium/large)	long bone	diaphyseal fragment			4
	37	*Sylvilagus* sp.	metatarsal 4	proximal end	right		1
	37	Carnivora	metapodial	distal end			1
	37	*Felis rufus*	mandible	horizontal ramus portion	right		1
	37	*Felis rufus*	permanent tooth	lower PM3	right		1
	37	*Felis rufus*	permanent tooth	lower PM4	right		1
	37	*Odocoileus* sp.	distal phalange	complete or nearly complete			1
	37	*Antilocapra / Odocoileus*	axis	fragment	axial		1
	37	*Antilocapra / Odocoileus*	fused 3rd and 4ft metatarsal	anterior portion of shaft			1
	37	*Antilocapra / Odocoileus*	proximal phalange	distal end			1
	37	*Antilocapra / Odocoileus*	fused 2nd and 3rd tarsal	complete or nearly complete	left		1
	38	Vertebrata	indeterminate	fragment			5
	38	Small/medium vertebrata	long bone	diaphyseal fragment			3
	38	Medium/large vertebrata	indeterminate	fragment			1
	38	Medium/large vertebrata	long bone	diaphyseal fragment			4
	38	Mammalia (medium/large)	indeterminate	fragment			10
	38	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	38	Mammalia (large)	indeterminate	fragment			1
	38	Mammalia (large)	long bone	diaphyseal fragment			1
	38	cf. *Odocoileus* sp.	tibia	proximal posterior medial end	left		1
	39	Vertebrata	indeterminate	fragment			4
	39	Small/medium vertebrata	long bone	diaphyseal fragment			1
	39	Mammalia (medium/large)	indeterminate	fragment			6
	39	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	40	Vertebrata	indeterminate	fragment			2
	40	Mammalia (medium/large)	indeterminate	fragment			10
	40	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	41	Vertebrata	indeterminate	fragment			7
	41	Mammalia (medium/large)	indeterminate	fragment			5
	41	Mustelidae	mandible	horizontal ramus portion	right		1
	41	Mustelidae	permanent tooth	lower C	right		1
	41	Mustelidae	permanent tooth	lower PM3	right		1
	41	Mustelidae	permanent tooth	lower PM4	right		1
	41	Mustelidae	permanent tooth	lower M1	right		1
	42	Vertebrata	indeterminate	fragment			12
	42	Mammalia (medium/large)	indeterminate	fragment			1
	42	Mammalia (large)	cranium	petrosal			1
	42	*Antilocapra / Odocoileus*	proximal phalange	distal end			1
	43	Small/medium vertebrata	long bone	diaphyseal fragment			1
41CV722	11	Mammalia (medium/large)	indeterminate	fragment			13
	11	Mammalia (large)	alveolar ridge fragment	fragment			1
	11	Mammalia (large)	long bone	diaphyseal fragment			3
	11	*Odocoileus* sp.	permanent tooth	upper PM2	right	moderate wear; adult	1
	11	*Odocoileus* sp.	permanent tooth	upper PM3	right	moderate wear; adult	1

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41CV722, *continued*	11	*Odocoileus* sp.	permanent tooth	upper PM4	right	moderate wear; adult	1
	11	*Odocoileus* sp.	radius	distal end	left		1
	11	*Odocoileus* sp.	distal phalange	proximal end			1
	11	*Antilocapra / Odocoileus*	cranium	petrosal			1
	11	*Antilocapra / Odocoileus*	metatarsal	anterior portion of shaft			2
	12	Mammalia (medium/large)	indeterminate	fragment			10
	12	Mammalia (large)	indeterminate	fragment			1
	12	Mammalia (large)	rib	shaft fragment		8+ cut marks	1
	12	Mammalia (large)	long bone	diaphyseal fragment			3
	12	*Odocoileus* sp.	alveolar ridge fragment	fragment			1
	12	*Odocoileus* sp.	permanent tooth	upper M1	right	moderate wear; adult	1
	12	*Odocoileus* sp.	permanent tooth	upper M2	right	moderate wear; adult	1
	12	*Odocoileus* sp.	permanent tooth	lower M3	right		1
	12	*Odocoileus* sp.	tibia	distal end	right		1
	12	*Odocoileus* sp.	fused central/fourth tarsal	complete or nearly complete	left		1
	12	*Antilocapra / Odocoileus*	mandible	horizontal ramus fragment	right		1
	12	*Antilocapra / Odocoileus*	patella	fragment			1
	13	Mammalia (medium/large)	indeterminate	fragment			7
	13	Mammalia (large)	vertebra	centrum	axial		1
	14	Mammalia (medium/large)	indeterminate	fragment			1
	20	Mammalia (medium/large)	indeterminate	fragment			13
	20	*Antilocapra / Odocoileus*	axis	odontoid process	axial		1
	22	Vertebrata	indeterminate	fragment			1
	23	Vertebrata	indeterminate	fragment			1
	23	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	31	Vertebrata	indeterminate	fragment			1
	31	Mammalia (medium/large)	indeterminate	fragment			1
	34	Vertebrata	indeterminate	fragment			2
	37	Vertebrata	indeterminate	fragment			1
	39	Mammalia (medium/large)	indeterminate	fragment			1
	39	*Odocoileus* sp.	middle phalange	proximal end			1
	39	*Antilocapra / Odocoileus*	radius	proximal lateral end	right		1
	39	*Antilocapra / Odocoileus*	radius	proximal medial end	right		1
	49	Vertebrata	indeterminate	fragment			3
	49	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	53	Mammalia (medium/large)	indeterminate	fragment			2
	54	Vertebrata	indeterminate	fragment			4
	54	Mammalia (medium/large)	indeterminate	fragment			1
	56	Vertebrata	indeterminate	fragment			9
	56	Mammalia (medium/large)	indeterminate	fragment			2
	56	*Odocoileus* sp.	tibia	proximal end	right		1
	56	*Antilocapra / Odocoileus*	metapodial	posterior portion of shaft			1
	57	Vertebrata	indeterminate	fragment			8
	57	*Odocoileus* sp.	distal phalange of paradigit	complete or nearly complete			1
	60	Mammalia (medium/large)	indeterminate	fragment		approximately 8 cut marks	1
	61	Mammalia (medium/large)	indeterminate	fragment			1
41CV1478	1	Vertebrata	indeterminate	fragment			1
	1	Colubridae	dorsal vertebra	complete or nearly complete	axial		9
	2	Mammalia (medium/large)	indeterminate	fragment			1
	2	Mammalia (large)	long bone	diaphyseal fragment			1
	3	Vertebrata	indeterminate	fragment			27

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41CV1478,	3	Medium/large vertebrata	long bone	diaphyseal fragment			1
continued	3	Testudinata	shell fragment	fragment			2
	3	Mammalia (medium)	proximal phalange	distal end			1
	3	Mammalia (medium/large)	indeterminate	fragment		pathological;unfused;subadult	6
	3	Mammalia (medium/large)	lumbar vertebra	complete or nearly complete	axial		1
	3	Mammalia (large)	indeterminate	fragment			1
	3	Mammalia (large)	long bone	diaphyseal fragment			1
	3	*Castor canadensis*	permanent tooth	lower M1 or M2	right		1
	3	*Odocoileus* sp.	distal phalange	complete or nearly complete			1
	3	*Antilocapra / Odocoileus*	middle phalange	distal end			1
	4	Vertebrata	indeterminate	fragment			19
	4	Medium/large vertebrata	indeterminate	fragment			1
	4	Aves (large)	long bone	diaphyseal fragment			1
	4	Mammalia (small)	radius	proximal end	left		1
	4	Mammalia (medium/large)	indeterminate	fragment			6
	4	Mammalia (medium/large)	rib	vertebral end			1
	4	Mammalia (medium/large)	costal cartilage	fragment			1
	4	Mammalia (large)	indeterminate	fragment			2
	4	Mammalia (large)	long bone	diaphyseal fragment		with incisor	1
	4	*Sylvilagus* sp.	mandible	incisor and diastema area only	right		1
	4	*Sylvilagus* sp.	calcaneus	complete or nearly complete	left		1
	4	cf. *Sylvilagus* sp.	pelvis	ischium fragment	left		1
	4	*Castor canadensis*	tooth, permanent/decid. ind.	enamel fragment			1
	4	Carnivora	astragalus	complete or nearly complete	left		1
	5	Vertebrata	indeterminate	fragment		bone tool, 1478-005	8
	5	Aves (large)	tibiotarsus	diaphyseal fragment	left		1
	5	Mammalia (medium/large)	indeterminate	fragment			6
	5	Mammalia (large)	long bone	diaphyseal fragment			1
	6	Vertebrata	indeterminate	fragment			1
	6	Mammalia (medium/large)	indeterminate	fragment			1
	7	Vertebrata	indeterminate	fragment			1
	11	Mammalia (medium/large)	indeterminate	fragment			1
	11	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	12	Vertebrata	indeterminate	fragment			1
	12	Mammalia (medium/large)	indeterminate	fragment			1
	13	Vertebrata	indeterminate	fragment			1
	13	Mammalia (small/medium)	alveolar ridge fragment	fragment			3
	14	Mammalia (medium/large)	indeterminate	fragment			1
	15	Vertebrata	indeterminate	fragment			15
	15	Mammalia (medium/large)	indeterminate	fragment			8
	15	*Antilocapra / Odocoileus*	axis	odontoid process	axial		1
	16	Vertebrata	indeterminate	fragment			3
	16	Testudinata	shell fragment	fragment			1
	16	Mammalia (medium/large)	indeterminate	fragment			2
	17	Mammalia (medium/large)	indeterminate	fragment			3
	18	Vertebrata	indeterminate	fragment			2
	18	Mammalia (medium)	long bone	diaphyseal fragment		bone tool, 1478-018	12
	18	Mammalia (medium/large)	indeterminate	fragment			4
	18	Mammalia (large)	indeterminate	fragment			1
	18	*Sylvilagus* sp.	calcaneus	complete or nearly complete	left		1
	19	Vertebrata	indeterminate	fragment			1

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41CV1478, *continued*	19	Mammalia (medium/large)	indeterminate	fragment			1
	19	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	19	*Sylvilagus* sp.	astragalus	fragment	right		1
	21	Vertebrata	indeterminate	fragment			1
	21	Viperidae	dorsal vertebra	complete or nearly complete	axial		1
41CV1479	3	Large vertebrate, class ind.	phalange	distal end			1
	3	*Odocoileus* sp.	antler	fragment			1
	9	Mammalia (small)	sacrum	sacral element	axial		1
	13	Sciuridae	femur	proximal end	right		1
	15	Vertebrata	indeterminate	fragment			3
	15	Mammalia (medium/large)	indeterminate	fragment			1
	15	*Odocoileus virginianus*	intermediate carpal bone	complete or nearly complete	left		1
	16	Vertebrata	indeterminate	fragment			2
	17	Vertebrata	indeterminate	fragment			3
	18	Vertebrata	indeterminate	fragment			5
	18	Mammalia (medium/large)	indeterminate	fragment			2
	19	Vertebrata	indeterminate	fragment			4
	20	Vertebrata	indeterminate	fragment			6
	22	*Antilocapra / Odocoileus*	axis	odontoid process	axial		1
	23	Vertebrata	indeterminate	fragment			1
	25	Vertebrata	indeterminate	fragment			2
	26	Vertebrata	indeterminate	fragment			8
	28	Vertebrata	indeterminate	fragment			1
	29	Vertebrata	indeterminate	fragment			3
	30	Vertebrata	indeterminate	fragment			4
	30	Mammalia (medium/large)	vertebra	articular facet	axial		1
	32	Mammalia (medium/large)	indeterminate	fragment			4
	32	Mammalia (large)	rib	vertebral end	right		1
	32	*Antilocapra / Odocoileus*	metapodial	distal articular condyle			1
	33	Vertebrata	indeterminate	fragment			6
	33	Mammalia (large)	indeterminate	fragment			4
	33	Mammalia (large)	long bone	diaphyseal fragment			1
	35	Vertebrata	indeterminate	fragment			18
	35	Vertebrata	mandible	horizontal ramus fragment	left		1
	35	Mammalia (medium/large)	indeterminate	fragment			3
	35	Mammalia (medium/large)	tooth, permanent/decid. ind.	root fragment			1
	35	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	35	Mammalia (large)	indeterminate	fragment			3
	36	Vertebrata	indeterminate	fragment			24
	36	Medium/large vertebrata	long bone	diaphyseal fragment			1
	36	Mammalia (medium/large)	indeterminate	fragment			12
	36	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	36	*Odocoileus* sp.	proximal phalange	proximal end			1
	36	*Antilocapra / Odocoileus*	fused 2nd and 3rd tarsal	complete or nearly complete	right		1
	37	Vertebrata	indeterminate	fragment			98
	37	Mammalia (medium/large)	indeterminate	fragment			30
	37	Mammalia (medium/large)	permanent tooth	incisor			1
	37	Mammalia (medium/large)	rib	shaft fragment			1
	37	Mammalia (medium/large)	rib	shaft fragment		numerous parallel cuts	1
	37	Mammalia (large)	vertebra	fragment	axial		1
	37	Mammalia (large)	long bone	diaphyseal fragment			8

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41CV1479, *continued*	37	*Sylvilagus* sp.	mandible	horizontal ramus w/incisor alveolus	right		1
	37	*Odocoileus* sp.	ulna	semi-lunar notch only	left	bone tool, ulna awl	1
	37	*Antilocapra / Odocoileus*	fused 3rd and 4th metatarsal	proximal anterior end	right		1
	37	*Antilocapra / Odocoileus*	fused 3rd and 4th metatarsal	proximal posterior end	right		1
	38	Vertebrata	indeterminate	fragment			15
	38	Mammalia (medium/large)	indeterminate	fragment			2
	38	Mammalia (medium/large)	cranium	fragment			2
	38	*Antilocapra / Odocoileus*	cranium	premaxilla	right		1
	41	Testudinata	neural	complete or nearly complete	axial		1
	42	Vertebrata	indeterminate	fragment			2
41CV1480	6	Vertebrata	indeterminate	fragment			1
	8	Vertebrata	indeterminate	fragment			20
	8	Vertebrata	indeterminate	fragment		rodent gnawed	1
	8	Testudinata	shell fragment	fragment			1
	8	Mammalia (medium/large)	rib	shaft fragment			1
	8	Mammalia (large)	rib	vertebral end	right		1
	9	Vertebrata	indeterminate	fragment			1
	9	Kinostemidae	peripheral	complete or nearly complete			1
	10	Mammalia (medium/large)	indeterminate	fragment			2
	12	Testudinata	shell fragment	fragment			4
	15	Testudinata	shell fragment	fragment			1
41CV1482	1	Vertebrata	indeterminate	fragment			1
	1	Mammalia (medium/large)	indeterminate	fragment			2
	2	Vertebrata	indeterminate	fragment			4
	3	Vertebrata	indeterminate	fragment			4
	3	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	4
	3	Mammalia (medium/large)	indeterminate	fragment			1
	3	Mammalia (medium/large)	cranium	fragment			3
	4	Vertebrata	indeterminate	fragment			11
	4	Testudinata	shell fragment	fragment			1
	4	Mammalia (medium/large)	indeterminate	fragment			6
	4	Mammalia (medium/large)	rib	vertebral end	right		1
	4	Mammalia (large)	long bone	diaphyseal fragment		epiphysis unfused; subadult	1
	4	*Antilocapra / Odocoileus*	proximal phalange	anterior portion of shaft			1
	4	*Antilocapra / Odocoileus*	middle phalange	distal anterior end			1
	5	Vertebrata	indeterminate	fragment			8
	5	Mammalia (medium/large)	tooth permanent/decid. ind.	root fragment			1
	6	Vertebrata	indeterminate	fragment			2
	6	Mammalia (medium/large)	indeterminate	fragment			2
	6	Mammalia (medium/large)	alveolar ridge fragment	fragment			1
	6	Mammalia (large)	long bone	diaphyseal fragment			2
	7	*Antilocapra / Odocoileus*	radius	proximal lateral end	left		1
	11	Testudinata	shell fragment	fragment			1
	11	Mammalia (medium/large)	indeterminate	fragment			2
	12	Vertebrata	indeterminate	fragment			1
	12	Mammalia (medium/large)	indeterminate	fragment			1
	13	Vertebrata	indeterminate	fragment			1
	13	Mammalia (large)	long bone	diaphyseal fragment		epiphysis unfused; subadult	3
	13	*Antilocapra / Odocoileus*	metapodial	distal articular condyle			1
	14	Vertebrata	indeterminate	fragment			4
	14	Testudinata	shell fragment	fragment			2

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41CV1482, *continued*	14	Testudinata	peripheral	fragment			1
	14	Mammalia (medium/large)	indeterminate	fragment			2
	14	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	15	Vertebrata	indeterminate	fragment			3
	15	Mammalia (medium/large)	indeterminate	fragment			7
	15	Mammalia (medium/large)	long bone	diaphyseal fragment			2
	15	*Lepus californicus*	humerus	distal end	left		1
	15	*Antilocapra / Odocoileus*	proximal phalange	distal anterior end			1
	15	*Antilocapra / Odocoileus*	middle phalange	distal anterior end			1
	16	Mammalia (medium/large)	indeterminate	fragment			2
	16	Mammalia (large)	long bone	diaphyseal fragment			1
	18	Vertebrata	indeterminate	fragment			1
	18	Anura	pelvis	ilium complete			1
	19	Mammalia (medium/large)	indeterminate	fragment			7
	19	Mammalia (large)	scapula	glenoid fossa and incomplete blade	left		1
	20	Mammalia (medium/large)	indeterminate	fragment			1
	20	Mammalia (medium/large)	rib	shaft fragment			7
	22	Vertebrata	indeterminate	fragment			1
	22	Testudinata	shell fragment	fragment			1
	22	cf. Testudinata	distal phalange	complete or nearly complete			1
	22	Mammalia (medium/large)	indeterminate	fragment			3
	22	Mammalia (medium/large)	long bone	diaphyseal fragment			2
	23	Mammalia (medium)	radius	diaphyseal fragment	left		1
	23	Mammalia (medium/large)	indeterminate	fragment			1
	24	Vertebrata	indeterminate	fragment			2
	25	Vertebrata	indeterminate	fragment			4
	25	Mammalia (medium/large)	indeterminate	fragment	left		2
	25	Mammalia (medium/large)	long bone	diaphyseal fragment			1
	25	*Odocoileus* sp.	permanent tooth	lower I			1
	26	Vertebrata	indeterminate	fragment			3
	27	Mammalia (medium/large)	indeterminate	fragment			1
	30	Vertebrata	indeterminate	fragment			2
	30	Aves (medium/large)	coracoid	proximal portion of shaft			1
	31	Vertebrata	indeterminate	fragment			1
	32	Mammalia (medium/large)	indeterminate	fragment			2
	32	Mammalia (large)	long bone	diaphyseal fragment			1
	35	Vertebrata	indeterminate	fragment			3
41CV1549	11	Mammalia (medium/large)	indeterminate	fragment			4
	11	Mammalia (large)	long bone	diaphyseal fragment			5
	12	Medium/large vertebrata	long bone	diaphyseal fragment		rodent gnawed	1
	12	*Geomys* sp.	mandible	horizontal ramus w/incisor alveolus	left	with PM4–M2	1
	16	Mammalia (medium/large)	indeterminate	fragment			1
	17	Vertebrata	indeterminate	fragment			8
	17	Mammalia (medium/large)	indeterminate	fragment			2
	17	Mammalia (medium/large)	indeterminate	fragment		rodent gnawed	1
	17	Mammalia (medium/large)	cranium	fragment			4
	17	Mammalia (medium/large)	rib	shaft fragment			1
	17	Mammalia (medium/large)	humerus	distal end	left	rootlet etching	1
	18	Mammalia (medium/large)	indeterminate	fragment			4
	18	*Odocoileus* sp.	permanent tooth	cheek tooth			1

Table 81, continued

Site	Lot	Taxon	Element	Portion of Element	Side	Comments	Total
41CV1549, *continued*	19	Vertebrata	indeterminate	fragment			6
	20	Vertebrata	indeterminate	fragment			2
	20	Mammalia (medium)	radius	diaphyseal fragment			1
	21	Mammalia (medium/large)	indeterminate	fragment			1
	21	*Antilocapra / Odocoileus*	proximal phalange	distal posterior end			1
	22	Medium/large vertebrata	long bone	diaphyseal fragment			1
	23	Mammalia (medium/large)	indeterminate	fragment			1
	38	Vertebrata	indeterminate	fragment			2
	43	Mammalia (medium/large)	indeterminate	fragment			1
	43	Mammalia (large)	long bone	diaphyseal fragment			1
	68	Vertebrata	indeterminate	fragment			4
	73	Vertebrata	indeterminate	fragment			1
Total							1,433

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APPENDIX D: Recovery and Analysis of Macrobotanical Samples

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INTRODUCTION

The research design that guides the investigation and evaluation of prehistoric sites at Fort Hood recognizes the importance of macrobotanical remains for interpreting human subsistence activities and paleoenvironmental reconstructions (Ellis et al. 1994:187). Consequently, the FY 1995 site testing program sought to recover, evaluate preservation potential, and identify selected samples of charred plant remains from cultural deposits to more fully assess the research potentials of the archeological sites. Macrobotanical remains were recovered in two primary ways: as specific samples of charred materials (e.g., wood charcoal) and from flotation of archeological sediment samples. These remains were classified as being from either feature or nonfeature contexts. Archeological sampling and processing of sediments and charred plant remains and the analysis of selected macrobotanical materials are described below.

CHARCOAL SAMPLE RECOVERY AND CHARRED WOOD IDENTIFICATION

Whenever possible, charred plant remains encountered during excavations of intact cultural deposits were collected as special samples (Table 82). Charcoal was sometimes present in disturbed deposits, but samples were not taken. Charred remains were present in most sites but were not well preserved in most cases. Fragments large enough to be recognized and individually sampled during excavation were rare; it is revealing that 16 of the 22 samples of charred materials submitted for radiocarbon dating (see Appendix A) were too small for conventional dating and had to be dated by the AMS method. Charcoal preservation was generally best in association with burned rock features, but charcoal was not abundant at any site. Even in the extensive burned rock midden at 41BL155B, where dark, organic-rich sediment was ubiquitous, preservation of charred remains was not exceptional.

Whether recovered by flotation or as individual samples, all of the charred materials selected for radiocarbon dating were first examined to determine if they were sufficiently large and/or complete for taxa/species identification. Of the 22 charred organic samples that were dated, only 3 samples of charred wood (nonflotation) were large enough to be submitted to the Paleoethnobotanical Laboratory (at Texas A&M University) for wood identification. These samples and the results of this analysis are summarized in Table 83. The radiocarbon dates derived from these samples are presented in Appendix A.

ARCHEOLOGICAL SEDIMENTS AND MACROBOTANICAL ANALYSIS

Forty sediment samples from cultural contexts at 9 of the 19 investigated sites were floated (Table 84). The contexts from which these samples were collected include 34 samples from features identified in excavations, 1 sample from a possible hearth observed eroding from a cutbank, 3 samples from nonfeature excavated contexts, and 2 samples from ash anomalies not designated as features. After the sediment samples were floated, the recovered materials were visually scanned to evaluate the preservation of charred macrobotanical remains. The basic evaluation of each sample consisted of noting the presence or absence of charred woods, nut hulls, and seeds, and assessing the preservation potential for charred botanical remains as low, moderate, or high.

Six flotation samples were submitted to the Paleoethnobotanical Laboratory at Texas A&M University. The samples analyzed for this study were recovered from five open campsites in Coryell County and one rockshelter in Bell County. Each flotation sample was sorted through a series of four nested geological screens with mesh sizes ranging from 4 mm to 0.450 mm. Each size grade was scanned for seeds, nuts, fruits, and other edible plant parts under a binocular dissecting microscope at eight different magnifications. In addition, carbonized wood fragments were separated from the 4-mm screen and quickly examined for the presence of agave or sotol caudex fragments. This was to identify the presence and density and to establish accurate counts of the carbonized remains of all edible plant taxa in the samples.

Identifications were then made using reference collections at Texas A&M University. The plant reference material utilized for this study was collected primarily from the Tonto Basin. Wood was collected from more than one example

Table 82. Summary of sites yielding samples of charred remains from intact cultural deposits (special samples other than flotation)

Site	Site type	Samples: Feature Contexts	Samples: Nonfeature Contexts
41BL69	Rockshelter	3	–
41BL155	Other open campsite	2	1
41BL181	Rockshelter	–	–
41BL579	Rockshelter	–	2
41BL581	Rockshelter	–	3
41BL582	Rockshelter	–	3
41BL667	Rockshelter	–	–
41BL816	Other open campsite	–	–
41BL827	Rockshelter	4	4
41CV722	Other open campsite	2	5
41CV944	Rockshelter	–	3
41CV1348	Rockshelter	–	–
41CV1473	Leon River campsite	–	–
41CV1478	Leon River campsite	–	3
41CV1479	Leon River campsite	2	3
41CV1480	Leon River campsite	2	4
41CV1482	Leon River campsite	5	4
41CV1487	Leon River campsite	–	–
41CV1549	Other open campsite	2	2
Totals		22	37

of each species, and both branches and stems of woody plants were secured. Flowers, seeds, fruits, leaves, and roots were collected to provide as much comparative material as possible.

The anatomy of some woods is so similar that it is very difficult to identify them to the genus level. For this reason, some taxa are combined into wood types. For example, willow (*Salix* sp.) and cottonwood (*Populus* sp.), both members of the Salicaceae or willow family, have been lumped together to form an artificial category called a "type." All identifications in the "type" category represent identifications to the taxon level indicated by the name of the type. For example, the cypress/juniper type includes all junipers and the bald cypress.

The oaks comprise at least 54 species of the genus *Quercus*. It is possible under some conditions of preservation to divide the genus into three groups, live oaks, red oaks, and white oaks. Because of the condition of charcoal encountered in these samples, however, I have chosen to place the oaks into a single type, the oak wood type.

The charred fiber-vascular bundles of agave, sotol and yucca also present special identification problems. Both Bohrer (1987:72) and Kwiatkowski (1992:327) have determined that only fibers with trough-shaped cross sections can be identified as agave. Agave, sotol, yucca, and beargrass can also be identified by the presence of other diagnostic parts such as leaf fragments, spines, or flower stalks. Remains of fiber-vascular bundles that contain styloid or raphide crystals with D-shaped, round, or flat fibers are placed in the general category "Agavaceae" and may actually be the remains of sotol, yucca, or beargrass. In addition, charred fibers with round cross sections but lacking crystals may also be sotol, yucca, or beargrass, and these were placed in the same general category, Agavaceae.

The results of the macrobotanical analysis are presented in Table 85. Due to the limited data base in this study, raw counts/weights are presented. The seeds and fruits were counted, and the first 25 pieces of wood were examined and identified. All of the wood charcoal was weighed, and the total weight, is presented. The archaeobotanical assemblage consists of charred plant remains of at least 13 taxa. Because of preservation problems encountered at open sites, only the charred plant taxa were considered by to part of the archaeological record (Bryant and Dering 1995). Forty-three charred seeds and nut

Table 83. Results of macrobotanical analysis of radiocarbon-dated charred wood samples

Site	Site type	Sample	Provenience and context	Wood identification
41BL827	Rockshelter	C7	TU 3, 40–50 cm, Feature 2	Deciduous oak (*Quercus* sp.)
41CV1478	Open campsite	C2	TU 1, 190–200 cm, cultural zone	Deciduous oak (*Quercus* sp.)
41CV1480	Open campsite	C2	TU 1, 160–170, Feature 1	Maple (*Acer* sp.)

Table 84. Summary of flotation sample recovery and evaluation of macrobotanical preservation potential

Site	Site type	Sample	Provenience and context	Observed remains: Charred wood	Observed remains: Charred nuts/ seeds	Evaluation of preservation potential: Low	Moderate	High
41BL155	Open camp	F1	TU 2 10–20 cm/Feature 1	–	–	X		
		F2	TU 1 10–20 cm/Feature 1	–	–	X		
		F3	TU 1 20–30 cm/Feature 1	–	–	X		
		F4	TU 3 10–20 cm/Feature 1	X	–	X		
		F5	TU 3 20–30 cm/Feature 1	–	–	X		
		F6	TU 2 20–30 cm/Feature 1	–	–	X		
		F7	TU 3 30–40 cm/Feature 1	X	–	X		
		F8	TU 3 40–50 cm/Feature 1	–	–	X		
		F9	TU 2 40–60 cm/Feature 2	–	–	X		
		F10	TU 1 40–50 cm/Feature 1	–	–	X		
		F11	TU 5 10–20 cm/Feature 1	–	–	X		
		F12	TU 5 20–30 cm/Feature 1	–	–	X		
		F13	TU 5 30–35 cm/Feature 2	–	–	X		
		F14	TU 5 35–40 cm/Feature 2	–	–	X		
		F15	TU 5 40–43 cm/Feature 2	–	–	X		
		F16	TU 5 16–49 cm/Feature 2	–	–	X		
41BL581	Rockshelter	F1	TU 2 50–60 cm/Feature 1	X	–	X		
41BL582	Rockshelter	F1	TU 2 30–40 cm/Feature 1	X	X	X		
41CV722	Open camp	F1	TU 3 30–40 cm/Feature 1	X	–		X	
		F2	TU 6 40–50 cm/general level	X	X			X
		F3	TU 11 38–42 cm/Feature 3	X	–	X		
41CV1478	Open camp	F1	TU 1 190–200 cm/general level	X	–		X	
		F2	TU 3 165–180 cm/Feature 1	X	X	X		
		F3	Cutbank 90 cm/possible hearth	X	–	X		
41CV1479	Open camp	F1	TU 2 200–203 cm/Ash anomaly	X	–			
		F2	TU 1 230 cm/Feature 1	X	–		X	
		F3	TU 1 250–255 cm/below Feature 1	X	–	X	X	
		F4	TU 1 216–220 cm/Ash anomaly	X	–	X		
41CV1480	Open camp	F1	TU 1 160–180 cm/Feature 1	X	–			X
		F2	TU 1 160–173 cm/Feature 2	X	X			X
		F3	TU 2 219–257 cm/general level	X	–	X		
41CV1482	Open camp	F1	TU 3 100–103 cm/Feature 1	X	–		X	
		F2	TU 2 130–135 cm/Feature 2	X	–	X		
		F3	TU 1 126–133 cm/Feature 3	X	–	X		
		F4	TU 2 183–187 cm/Feature 4	X	–	X		
41CV1549	Open camp	F1	TU 1 88–95 cm/Feature 2	X	X	X		
		F2	TU 3 150–160 cm/Feature 3 surrounding matrix	X	–		X	
		F3	TU 3 150–160 cm/Feature 3	X	–	X		
		F4	TU 5 50–60 cm/Feature 5	–	–	X		
		F5	TU 2 190–200 cm/Feature 4	X	–	X		

or fruit fragments from at least five taxa were counted in the samples. Two samples contain what appear to be root fragments of a plant containing round fiber-vascular bundles and styloid and raphide-shaped calcium oxalate crystals. In addition, wood fragments from at least six taxa were identified.

The samples from two sites, 41CV722 and 41CV1482, did not contain identifiable carbonized plant remains. Carbonized remains from the other three sites are described below.

41CV1478: Two unidentifiable seed fragments and a juniper seed were identified in the samples from this site. The seed coats of both of

Table 85. Results of macrobotanical analysis of flotation samples

Site	Sample	Feature	Provenience	Identification	Part	Count	Weight (g)
41CV722	F-1	Feature 1	TU 3, 30–40 cm	No identifiable carbonized plant remains			
41CV1478	F-1		TU 1, 190–200 cm	indeterminate	seed fragment	1	
				indeterminate	seed fragment	1	
				Juniperus sp.	seed	1	
				Platanus sp.	wood	3	0.1
				Quercus wood type	wood	25+	2.2
				cf. *Yucca* sp.	root/stem	3	0.1
41CV1479	F-1	Ash anomaly	TU 2, 200–203 cm	*Carya* sp.	nut fragment	3	
				Juniperus sp.	seed	1	
				Asteraceae	achene	1	
				Cyperaceae	seed	12	
				Poaceae	seed	8	
				Quercus wood type	wood	13	0.2
41CV1480	F-1	Feature 1	TU 1, 160–180 cm	indeterminate	seed	10	
				cf. *Yucca* sp.	root	25+	7.0
41CV1480	F-2	Feature 2	TU 1, 160–173 cm	*Celtis* sp.	nutlet	5	
				Diospyros virginiana	wood	25+	5.4
				woody legume	wood	3	0.2
				Rosaceae	wood	5	0.2
41CV1482	F-1	Feature 1	TU 3, 100–103 cm	No identifiable carbonized plant remains			

the unidentifiable seeds are very abraded, rendering accurate determination impossible. Charred wood fragments include the oak wood type and *Platanus* sp. and a root that resembles *Yucca* sp. The *Yucca* identification is made at the cf. (compares favorably) level because the reference collection from Fort Hood is very incomplete, and the wood of other plants may resemble this material.

41CV1479: This sample contains 22 carbonized seeds and 3 nut fragments, including *Carya* (hickory nut), Asteraceae (sunflower family), Cyperaceae (sedge family), and Poaceae (grass family). Seeds are not identifiable to genus or species level because distinctive features have eroded from the surface of the seed coats. Only one type of wood, *Quercus* wood type, was identified in the charcoal.

41CV1480: The two flotation samples from this site yielded three wood taxa: *Diospyros virginiana* (persimmon), and wood of the rose family (hawthorn or crabapple) and wood of the legume family (mesquite or honey locust). Over 10 g of carbonized wood was identified in the samples, attesting to the fact that the plant remains are plentiful in these sediments. In addition to the wood, charred remains also include unidentifiable seeds, hackberry nutlets, and *Yucca* root fragments.

The purpose of these investigations was to determine the potential of the archaeological sites to yield interpretable macrobotanical remains. The presence of substantial amounts of carbonized seeds and wood in some of the flotation samples indicates that charred plant remains resulting from prehistoric food preparation and/or other domestic activities have been preserved in discrete cultural contexts in the archeological record at some of these sites. If the charred remains recovered by flotation and analyzed in this study are representative, sites 41CV1482 and 41CV722 have a very low potential to yield macrobotanical data. On the other hand, sites 41CV1478, 41CV1479, and 41CV1480 appear to be quite productive.

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APPENDIX E: Fort Hood Chert Typology

The chert typology summarized herein represents all of the distinctive "types" of Edwards Group cherts known to occur naturally in and adjacent to Fort Hood. This typological classification consists of 27 distinctive types of chert; 16 types are defined from primary contexts (i.e., bedrock outcrops) on or near Fort Hood (Types 1–11 and 13–17), while 11 types are from secondary contexts (i.e., alluvial deposits) along Cowhouse and Table Rock Creeks (Types 18–28). Chert Type 12 is unassigned.

Data presented here were taken from previous investigations by Texas A&M University and TRC-Mariah personnel (see Abbott and Trierweiler 1995b:Appendix I; Trierweiler, ed. 1994:Appendix C).

TYPE 1: HEINER LAKE BLUE-LIGHT (HLB-LT)

Overall Appearance: This chert is homogeneous to very faintly banded, is opaque, emits a distinct ring upon being struck, and is generally white to yellowish gray in color. The coarseness of this material is reminiscent of the coarse inclusions in the Heiner Lake Tan (HLT) and Fort Hood Yellow materials (FHY). The reddish color it acquires when heat treated is also characteristic of the color change noted in FHY. It is possible that this material is a coarse-grained version of these other two chert types, particularly since it occurs at the extreme southeast end of the chert-bearing Edwards Formation. Dickens (1993a:82) says that HLB-LT is not found together with the HLT variety, but rather that one is superposed over the other with the blue variety occurring at slightly higher elevations than the tan. It is interesting that HLT also occurs in the same area around Heiner Lake, and in terms of coarseness it is between the HLB-LT and the finer FHY materials. FHY occurs in the central and western portions of the Edwards Formation. The sample specimen has a relatively thin but chalky orangish brown cortex.

Texture: It has a medium to coarse texture, and freshly broken surfaces often feel rather chalky. This material occurs around the outside of the nodules, while the chert comprising the core of the nodule is darker in color and has a finer texture. The nodules tend to be relatively homogeneous throughout the material. Although the material retains its fairly grainy texture, it demonstrates an improvement in workability in the mid and high temperature ranges.

Size Range: This material occurs in large (often greater than 1 m in diameter) disk-shaped nodules.

Quality: HLB-LT is a surprisingly workable material considering its grainy texture. It is easier to work during the early stage of reduction, with workability dropping to fair in the middle and late stages (secondary thinning and pressure flaking). Low-temperature heat treatment has little effect on material quality, while mid- and high-temperature treatments improve quality substantially (Frederick and Ringstaff 1994:167).

Type Locality: This material has been observed along the pipeline that runs roughly east-west immediately north of Heiner Lake in Quad 32/45.

TYPE 2: COWHOUSE WHITE (CW)

Overall Appearance: Cowhouse White chert is white or very light gray to bluish white. It is the only prominently banded chert in the existing taxonomy, and it grades to a mottled structure in the interior of large nodules. The band or bands of fine-grained translucent brownish light blue material occur immediately below the cortex but do not appear deeper in the nodules. Coarse-grained inclusions have a yellowish color which turns pinkish under heat treatment. The material is relatively flawless and opaque (Frederick and Ringstaff 1994:148). Its color is predominantly a dirty white, with occasional bands of light gray. Microscopically, there are numerous brownish "splotches" or specks throughout the material which no doubt contribute to the dirty appearance (Dickens 1993b:79).

Texture: It is fine- to coarse-grained chert and does not have the chalky surface texture of the Heiner Lake Blue-Light. The cortex is gray and ranges from thick to relatively thin and chalky. Heat-treated specimens turn a reddish pink color and acquire a slightly greater luster than specimens in their raw state.

Size Range: This chert occurs as large, flat, disk-shaped nodules most often found fractured into

blocky fragments, with longitudinal axes in excess of 20 cm. Complete nodules are uncommon but may be in excess of a meter in diameter and 20–30 cm thick (Frederick and Ringstaff 1994:148). It is found in both plate form and small- to medium-sized flattened nodules that often are cracked and broken (Dickens 1993b: 79). The majority of the nodules procured for the workability experiments were large (greater than 30 cm) and flat-ovate to more rounded (subspherical).

Quality: Unlike most grainy cherts, this variety can be worked very easily in its raw state. The edges and platforms are easily crushed, however, suggesting that it has less tensile strength than the other local cherts. Heat alteration has little effect other than perhaps further weakening its tensile strength. Experiments in heat altering have reached temperatures of 550°F; higher temperatures may be required before any noticeable changes occur (Dickens 1993b:79). The overall workability is rated as good, with the exception of pressure reduction, which is rated as fair (Frederick and Ringstaff 1994:168).

Type Locality: Material occurs on the Manning surface in the vicinity of Union Hill (Quad 38/45), north of the Cowhouse Creek arm of Belton Reservoir. The outcrop of this material appears to be restricted to the immediate vicinity of Union Hill, but similar material has been observed in Quad 16/59 cropping out from the upper slopes of the Manning surface on the south side of the Clabber Creek valley. A more extensive survey by Frederick (personal communication 1995) identified a wide distribution including other portions of the Southeast Chert Province (Quads 33/44, 39/45, 37/49, and 37/50), the North Forth Chert Province (Quad 35/54), and the northern portion of the Northwest Province (Quads 10/67, 10/63, 13/68, 14/62, 14/61, 14/60, 15/59, and 16/58) contiguous with the western edge of the North Fort Chert Province.

TYPE 3: ANDERSON MOUNTAIN GRAY (AMG)

Overall Appearance: This chert ranges widely in color from white, pale yellowish brown, and light gray around the exteriors to medium dark gray, olive gray, and brownish gray in the interior. Light blue fossiliferous inclusions are common in the matrix. The cortex is moderately thick and chalky and has a tan color.

Texture: It is often fossiliferous, is fine to medium textured, and can be best described as having a mottled structure. It is relatively opaque and has a dull luster; however, it acquires increased luster with heat treatment and also takes on a slight pinkish color.

Size Range: It seems to occur in disk-shaped nodules. At the bedrock source, nodules are quite variable in form, shape, and size.

Quality: At the bedrock source, quality was thought to be poor; most flake core removals and early biface reduction were rated poor to fair. The hardness of the material appears to make reduction difficult. Some improvement following heat treatment makes it rank as good (Frederick and Ringstaff 1994:168–169).

Type Locality: The type locality is Anderson Mountain in Quad 5/45 (Frederick and Ringstaff 1994:151). Frederick (personal communication 1995) has identified primary outcrops of AMG in four additional locations on or around Seven Mile Mountain (Quads 7/40, 8/38, 9/36, and 10/36), although Frederick and Ringstaff (1994:151) state that it is believed to occur as far north as Henson Lake and as far south as Seven Mile Mountain.

TYPE 4: SEVEN MILE MOUNTAIN NOVACULITE (SMN)

Overall Appearance: Seven Mile Mountain Novaculite displays a light gray, bluish gray, or pale blue color. It is one of the most translucent cherts in the taxonomy and often has vugs partially filled with megaquartz. The cortex is a porous, megaquartz-rich material; it often possesses a pronounced tabular fabric and is stained brownish red by the surrounding soil. In the raw state, this chert is very hard. However, the finer textured portions experience a radical metamorphosis after heating and often become almost vitreous in character. Often the light or pale blue matrix contains brownish orange swirls or veins that remain visible even when heat treated.

Texture: Typically, the texture of this chert is

coarsest on the outside, fines immediately beneath the cortex, and then coarsens again toward the center of nodule. The usable portions are found in the fine-textured zone between the cortex and the nodule centers. These nodule centers often exhibit a sugary fracture surface, probably due to the presence of megaquartz, whereas the finer textured portions have a smooth to slightly rough fracture surface and are characterized by thin, irregular yellow to orange veins. The texture of the material improves significantly when heat treated, and it also acquires a luster that is not evident on raw specimens. The material is very hard in its raw state and appears to contain many embedded fracture lines.

Size Range: This chert is found in rather large (often greater than 1 m in diameter and more than 40 cm thick) rounded to tabular nodules. The nodules acquired from the bedrock source were medium to large (approximately 15 to 40 cm) in size.

Quality: In the raw state this chert is very hard, but the finer-textured portions experience a radical metamorphosis after heating and often become almost vitreous in character. This chert is the worst of all 15 types included in the study in terms of workability. Heat treatment considerably improves its quality to a good workable state. Under heat treatment it reacts very similarly to Arkansas Novaculite, taking on a significant degree of luster. Workability in its raw state is rated as poor.

Type Locality: The type locality for this chert is Quad 7/38 on Seven Mile Mountain, but it has also been observed south of Heiner Lake. Secondary deposits of this chert are common along the valley walls of House and Clear Creeks (Frederick and Ringstaff 1994:151). A singular, probably primary outcrop was also noted by Frederick (personal communication 1995) on Anderson Mountain in Quad 5/45.

TYPE 5: TEXAS NOVACULITE (TN)

Overall Appearance: It is commonly light bluish gray, white or pale yellowish brown, and medium to fine textured, coarsely mottled, and moderately translucent. This form is not a true novaculite but instead is a variety of chert. It ranges from white to light gray-brown in color and is typically found in large, thick, egg-shaped nodules. A cross section of one of these nodules reveals a darker outer color of gray to gray-brown, terminating in a dark brown ring several inches into the nodule. The interior of the nodule is a lighter gray to off-white. Unsoiled cortex has a dark red brick color.

Texture: This material does not appear to be as grainy as Seven Mile Mountain Novaculite, although it has some very coarse quartzite pockets. Heat-treated specimens become dark gray and lose the light pale-bluish color portions notable on untreated specimens.

Size Range: The nodules collected from the bedrock sources tended to be large (15–30 cm) and subspherical.

Quality: In its raw state, Texas Novaculite is so hard that it is almost impossible to reduce. Samples from the bedrock source are difficult to work. Low- to mid-range heat treatment improves workability to fair/good, while high-temperature treatment results in good quality material.

Type Locality: A large deposit of this type is located on top of a ridge several hundred yards west of a large Gray-Brown-Green deposit. It is known only from a small area around East Range Road in Quad 31/59.

TYPE 6: HEINER LAKE TAN (HLT)

Overall Appearance: Heiner Lake Tan is light gray, light brownish gray, white, and grayish orange in color and typically has numerous round or irregularly shaped white mottles 1–5 mm in diameter (Frederick and Ringstaff 1994:152). The tan variety is light gray to brown with light specks throughout (Dickens 1993a:82) and is opaque to moderately translucent. The cortex is a light orange color similar to a light-colored brick.

Texture: This chert is medium to fine textured. Some translucence is also often seen in a very thin layer beneath the cortex of the tan variety. Heat treatment considerably improves flaking characteristics. Some specimens become relatively dark gray, while others remain light. In both cases, however, the specimens take on a

light red to pinkish appearance.

Size Range: Typically this variety comes in either large plates or egg-shaped nodules that may weigh up to 100 pounds or more. It occurs in dense nodular zones that are often more than 20 cm thick and in nodules in excess of 50 cm in diameter; it commonly breaks into blocky fragments in the outcrop.

Quality: In its raw state the material is easily reducible with a hammerstone during the early stage of reduction. The hardness of the material makes late stage reduction (i.e., thinning and pressure flaking) more difficult; thus, the workability of the material is ranked only fair in the middle to late stages of reduction. Heat treatment in the mid to high temperature ranges results in substantial improvement in workability, especially in the middle to late reduction stages.

Type Locality: A very large deposit of the tan variety is located in the area surrounding Heiner Lake; it is thought to be restricted to that area and not encountered elsewhere (Dickens 1993b:79). It has been observed in the immediate vicinity of Heiner Lake (Quad 32/45), and Frederick (personal communication 1995) identified an additional primary outcrop in this vicinity (Quad 33/44). The full areal extent of HLT outcrops in the Heiner Lake area is unknown (Frederick and Ringstaff 1994:152).

TYPE 7: FOSSILIFEROUS PALE BROWN (FPB)

Overall Appearance: Fossiliferous Pale Brown chert occurs as large disklike nodules, irregularly shaped but bedded parallel. It ranges in color from very pale brown, light yellow, light gray, and brownish gray, to white. It occasionally has pale blue, chalcedonic, veinlike inclusions and small (less than 1 mm) pale bluish white fossils which may impart a speckled appearance. It is mottled on a coarse scale, with the color changing abruptly from white to light yellowish brown near the nodule exterior to a brownish gray near the interior. The cortex is orangish brown.

Texture: This chert has moderate- to fine-grained texture with some very coarse chalcedonic to quartzitic inclusions.

Size Range: No information.

Quality: No information; no heat treatment experiments were undertaken.

Type Locality: The type locality for this chert is in Quad 33/48, where it crops out at the margin of the Manning surface overlooking the Cowhouse Creek valley. Occurrences in primary contexts also are known to exist in Quads 16/51, 31/50, and 34/51 (Frederick and Ringstaff 1994: 152) and Quads 16/58, 30/47, 31/51, and 34/51 (Frederick, personal communication 1995).

TYPE 8: FORT HOOD YELLOW (FHY)

Overall Appearance: Fort Hood Yellow is very pale brown to yellow in color and often has light gray mottles which are slightly coarser than the matrix. It is opaque, has a medium to dull luster, and is generally fine textured. It occasionally has voids or chalky mottles in the nodule interiors. FHY ranges from a solid light yellow to darker shades and occurs in large irregular nodules. The cortex is not nearly as chalky as for Heiner Lake Tan (HLT); it is relatively thin and has a tan color.

Texture: Although FHY is similar in appearance to HLT, the light gray inclusions in FHY are more fine grained. Heat-treated specimens take on a pinkish red and/or pinkish orange tone that is more noticeable than for HLT specimens. The interior of the material becomes glossy and fine textured and can be easily reduced.

Quality: The material is relatively soft and easily reducible, even in its raw state. However, it improves significantly when heat treated. FHY is one of the most workable materials on the installation. The only problems presented by this material were the presence of chalky voids often not detectable through visual examination and abrupt texture changes which were most often gray in color.

Size Range: The nodules collected from the bedrock source areas were quite variable in size (10–40 cm) and form (flat to subrounded to amorphous).

Type Locality: Dickens's (1993b:78) type locality is on Henson Mountain near the headwaters

of Owl Creek inside the Live Fire Area. A large deposit of this type is located on some ridges overlooking Owl Creek near the northeastern boundary of the post (North Fort Chert Province, Quads 29/60 and 30/58). It is most commonly seen in nodular form, but many of the nodules are cracked into small fragments. Similar material has been observed adjacent to East Range Road in Quad 25/63 and north of Royalty Ridge Road in Quads 17/67 and 17/68 (Frederick and Ringstaff 1994:152). An isolated outcrop also was noted in the northern portion of the West Range Chert Province, Quad 15/63 (Frederick, personal communication 1995). It is about 6 m long and is relatively homogeneous throughout. While FHY is common in the northwestern and central portion of the North Fort Chert province, HLT occurs in the southeastern portion of the same chert province and in the Southeast Chert Province immediately south of the southern portion of the North Fort Province. This spatial distribution suggests some connection between the two, perhaps a northwest to southeast grading of FHY into the coarser HLT as one moves across the base.

TYPE 9: HEINER LAKE TRANSLUCENT BROWN (HLTB)

Overall Appearance: This chert occurs in rounded blocky to tabular nodules and is dark gray or dark grayish brown to pale yellowish brown in color. It has striations which are often evident on the exterior of the nodule and act as cleavage planes. The cortex is thin, not chalky, and ranges in color from milky white to orangish brown. In addition to the banding, the inside of the material commonly has opaque white to yellowish brown rectangular mottles. It is fairly translucent and exhibits a dull luster which changes significantly upon heating, when the material darkens to a dark gray. Some of the white striations take on a light blue appearance when heat treated.

Texture: It is fine textured, although the striations are coarse grained and similar in texture to the coarse-grained inclusions in a number of the other chert types from the installation. Where these striations are long and continuous, the material is difficult to knap if the flake removals are not oriented parallel to these bands.

Size Range: No systematic information was collected, but blocky nodules of various sizes have been noted while visiting the type locality.

Quality: The material between the coarse-grained striations appears to be of fine texture and good quality. This fine-grained band can range from 1 to 6 cm in thickness. It is difficult to flake these nodules across the striations. Workability improves substantially under high-temperature heat treatment, but changes in quality are less notable under lower-temperature treatment.

Type Locality: It occurs in Quad 32/44 around Heiner Lake but also is known to occur as far as 5 km west of the lake. Its actual areal extent is unknown (Frederick and Ringstaff 1994:152).

TYPE 10: HEINER LAKE BLUE (HLB)

Overall Appearance: This is one of the two cherts in the project area that appears to be all blue (the other being Seven Mile Mountain Novaculite). It has a light to dark grayish appearance with a light bluish tinge. It has linear and spotty light bluish inclusions and light gray coarse-grained inclusions similar to those noted in some of the other Fort Hood materials. HLB has a thin, chalky cortex. Heat-treated specimens acquire a darker color and have a brown tinge. Frederick and Ringstaff (1994:173) note that HLB and Heiner Lake Blue-Light (HLB-LT) are often found together in the same nodule, with the main differences being that HLB is finer grained and harder than HLB-LT. Cortex color and texture are similar to HLB-LT, and HLB-LT's texture is similar to the portion of the HLB material immediately below the cortex.

Texture: The material is medium to fine grained with light gray inclusions that are relatively coarse grained in texture. The portion of the raw material immediately under the cortex is coarser grained than the deeper material.

Size Range: The bedrock sources contain large disk-shaped nodules (30–60 cm in diameter) and fractured blocky nodule fragments.

Quality: HLB is difficult to reduce in its raw state due to fossil inclusions, abrupt changes in texture, and material hardness. While early reduction flaking can be carried out with less

difficulty, biface thinning and pressure flaking of raw HLB is very difficult. Material quality and workability improve to good under high-temperature heat treatment (Frederick and Ringstaff 1994:165, 173–174).

Type Locality: HLB is named after a type of chert reported by J. B. Sollberger to be present in the vicinity of Heiner Lake. It occurs north of Heiner Lake in Quad 32/45, but its areal extent is otherwise unknown (Frederick and Ringstaff 1994:152–153). Dickens (1993b:79) mentions that HLB is found mixed with Heiner Lake Tan, is quite restricted in its range, and is not very abundant.

TYPE 11: EAST RANGE FLAT (ERF)

Overall Appearance: This chert occurs as irregularly shaped nodules that often have voids or chalky inclusions. It is opaque and finely to coarsely mottled and ranges in color from gray or light gray to light olive gray, becoming olive green toward the center. The same nodule often contains gray portions adjacent to light olive green sections, with both portions containing dark olive green specks that give it a freckled appearance. The cortex is thin but chalky and has a tan to brownish color.

Texture: It has a chalky feel, medium texture, and a very dull appearance. Heat treatment gives the material a strong luster but does not appear to darken the material. However, the dark green specks become less noticeable in the heat-treated specimens.

Size Range: No information.

Quality: The material has a slight chalky feel with only small, somewhat banded portions of the material having a fine texture. Frederick and Ringstaff (1994:174) indicate that flakes were easily removed from the cores but that many of the flakes had voids in them. The material improves once the portion with voids is reduced. However, the inner portion of the material is of poor quality in places, and the chalky portions lead to hinged removals. Material quality does not improve substantially upon low-temperature heat treatment, but substantial improvements are notable under mid- to high-temperature treatment.

Type Locality: It occurs in several canyons cut into the Owl Creek Mountains forming the southern valley wall of Owl Creek and the Leon River. The type locality for this chert is located on the north- and east-facing slopes of the Manning surface, southeast of the confluence of Preacher Creek and Owl Creek in Quad 36/56.

TYPE 13: EAST RANGE FLECKED (ER FLECKED)

Overall Appearance: This chert is dark gray to light gray and contains numerous small white flecks. The flecking is extremely heavy and grades to darker colors in nodule interiors. The cortex is chalky white and thin, somewhat reminiscent of the chalky cortex on Georgetown flint. The darkest colors of this material overlap with Owl Creek Black, but the flecking is much more pronounced than for that material.

Texture: It is medium to fine textured and opaque and has a medium to dull luster. Heat treatment considerably increases the luster.

Size Range: It consists of thin, often fractured nodules. Specimens from bedrock sources were procured in tabular forms varying in thickness from 1 to 10 cm.

Quality: In its raw state, the material is rated only fair in quality. Material hardness makes biface thinning and pressure flaking very difficult. Heat treatment showed marked improvement in workability, especially in the mid and high temperature ranges.

Type Locality: ER Flecked occurs in a relatively small outcrop located in East Range overlooking the Leon River portion of Belton Reservoir in Quad 41/48.

TYPE 14: FORT HOOD GRAY (FHG)

Overall Appearance: Fort Hood Gray occurs as irregular nodules. It ranges in color from light to dark gray, and occasionally bluish gray. It is mottled in appearance, and some light gray to bluish coarse-grained inclusions of irregular shape are present. FHG has a dull to medium luster and it occasionally has chalky mottles or voids. It is generally uniform in color but may vary due to slight mottling of light and dark

shades. This type occurs in the upper drainage area of Owl Creek in the form of thick "amoeba-shaped" nodules which come in a multitude of shapes and sizes. These nodules may be cylindrical or have small projections stemming from the main body in many directions. The cortex is relatively thick and chalky and is of a light gray to brownish color. The FHG nodules procured for the workability assessment often graded in color to the Gray-Brown-Green (GBG) material.

Texture: It is minimally translucent and fine textured. Heat treatment considerably increases luster and changes the surface color of the material to a pinkish shade, which ultimately changes to a deeper red by the end of the heat-treatment process.

Size Range: FHG occurs in large irregular nodules.

Quality: The quality of the material, even in its raw state, is rated as good in all stages of biface manufacture. Heat treatment improves workability at all temperature ranges, but the material can be easily worked without treatment.

Type Locality: It is known to crop out stratigraphically above GBG and grades into that material. Its occurrence beyond Quad 31/60 is unknown. Deposits of this type vary. Some have been observed eroding out from below the crest of a small hill, while in another area, large, very dark gray nodules were found eroding directly from limestone visible in the bottom of a drainage ditch that paralleled one of the post roads (Dickens 1993b:78).

TYPE 15: GRAY-BROWN-GREEN (GBG)

Overall Appearance: This is the most varied form encountered at Fort Hood. Its color ranges from gray-brown mottled, light brown to dark brown mottled, brown-green mottled, light olive gray to very dark gray mottled, and light green to dark green mottled. Some nodules contain bands of tough, grainy chert. Some nodules may be almost solid in any of the colors represented. It is similar to Fort Hood Yellow and Fort Hood Gray (FHG) in color, texture, chalky voids, and workability. GBG crops out below FHG and is also composed of irregularly shaped nodules, often in excess of 50 cm in diameter.

Texture: GBG has a fine texture, is opaque, and exhibits a medium to dull luster. Some chalky portions of the matrix are coarse grained, but most of the material is fine to medium grained. Heat treatment seems to improve the material, even for the coarse-grained inclusions.

Size Range: Many of the nodules weigh as much as 30 to 40 pounds.

Quality: After heat treatment this form is very easy to reduce, allowing production of a thinner biface than would be possible otherwise. However, the material in its raw state is also very easily worked with the exception of those nodules containing very grainy textures and inclusions.

Type Locality: It is known to occur in Quad 30/60, and elsewhere in the eastern part of the post, but beyond that its distribution is unknown. Two large deposits of GBG were encountered. One is eroding from the crest of a hill in the northern Owl Creek drainage area, and the other lies about a kilometer farther north. A large quarry site in the Henson Mountains region contained small but distinct deposits of FHG intermixed within GBG mottled deposits. This suggests that there may be a close relationship between these two varieties (Dickens 1993b:78).

TYPE 16: LEONA PARK (LP)

Overall Appearance: This chert is mottled dark gray to very light gray and has a pronounced horizontal fabric which is reminiscent of lenticular bedding. It is opaque and has a dull luster.

Texture: LP has a fine to medium texture with a slight chalky feel on some specimens. It has rounded to oval coarse inclusions and the texture is highly variable. There is no significant cortex on this material. It emits a strong petroleum odor upon breakage after heating.

Size Range: LP is a bedded chert with a thickness in excess of 50 cm in some places.

Quality: The workability of raw LP blocky nodules is rated as fair to poor. Heat treatment, especially at high temperatures, considerably improves the material.

Type Locality: LP occurs outside of Fort Hood on the east side of the Leon River arm of Belton Reservoir north of State Highway 36.

TYPE 17: OWL CREEK BLACK (OCB)

Overall Appearance: This chert ranges in color from black to dark gray and occasionally has elongated light gray mottles. It often has many very fine flecks oriented parallel to the long axis of the nodule. It is fine grained in texture. Light gray to light bluish mottles are common, as are coarse-grained light gray inclusions similar to those found in other materials.

Texture: It is opaque and has a medium to shiny luster and fine texture. The cortex can vary from white, to tannish brown, to orangish brown and is rather chalky and thick. Heat treatment increases the luster of the material and imparts a light pink color to the cortex; it reduces the grayness of the material, while increasing the black background.

Size Range: No information.

Quality: It is currently one of the more widely preferred cherts in the region and may have been so in the prehistoric past as well. OCB can be used in the raw without heat treatment. In fact, heat treatment at high temperatures may fracture the material.

Type Locality: The name of this chert suggests that it occurs in the Owl Creek basin, and Dickens (1993b:77) notes that it is a common constituent of Preachers Creek bedload. A bedrock source for this material is located in the Preacher Creek drainage basin, north of Fort Hood in Quad 36/60; it is suspected that OCB crops out on the base as well. If so, the most likely outcrop areas would be on the divide between Owl and Henson Creeks in training areas 63 and 64 in the Live Fire Area. At present, the major known deposit occurs in Owl Creek near the eastern boundary of Fort Hood. However, some caprock deposits have been reported. Some problem identifying the exact source of this type exists, as black cherts are also known to occur near the town of Flat and in the Leon River area, both located north of Fort Hood. The material coming from Flat can often be identified by the presence of pyrites and is primarily known from stream deposits. However, the material from the Leon River is virtually identical to the Owl Creek deposits. It is presently known from a small deposit varying several inches in thickness that is eroding from the caprock.

TYPE 18: COWHOUSE TWO TONE (CTT)

Overall Appearance: This is a two-tone chert characterized by a light gray to brownish gray color around the cobble exterior and a dark gray to somewhat purple center. A brownish tone is evident immediately below the cortex, which ranges from yellowish brown to light brown. Portions of some specimens have a light to dark gray mottled appearance at the transition between the exterior and interior of the nodule. Faint yellowish veins distributed through the material can be seen in some specimens.

Texture: CTT textures range from fine to medium with some coarse-grained inclusions. In general, specimens not heat treated are dull and exhibit little luster.

Size Range: No information.

Type Locality: It is the most common chert in the Cowhouse Creek bedload, accounting for more than half of the materials sampled by Abbott and Trierweiler (1995b:I-8).

TYPE 19: COWHOUSE DARK GRAY (CDG)

Overall Appearance: Cowhouse Dark Gray nodules range in color from relatively even dark gray interiors to moderately dark and very dark mottled specimens somewhat reminiscent of a gray version of Gray-Brown-Green (GBG). Both varieties contain numerous light gray to light blue fossiliferous inclusions and 1–3-mm quartz pockets. The evenly dark gray nodules have a very light blue to pale brown band ranging from 5 to 10 mm in thickness immediately below the cortex, which is brown. The mottled specimens have only a very faint light brown tint immediately below the thin (1 mm) brown cortex.

Texture: The specimens have fine to medium texture with some mottled specimens reminiscent of the quality of GBG and the dark gray

material similar to Owl Creek Black. Some moderately gray portions of the mottled variety tend to be medium to coarse grained. The light blue to pale brown band around the exterior of the evenly dark variety also tends to be medium to coarse grained. The unheated matrix is dull.

Size Range: No information.

Type Locality: CDG is found in a gravel bar in the active channel of Cowhouse Creek, immediately adjacent to the western edge of Fort Hood (Quad 6/61).

TYPE 20: COWHOUSE SHELL HASH (CSH)

Overall Appearance: This chert's matrix is light gray to white with yellowish brown overtones. It contains abundant arcuate-shaped, pale bluish to white shell fragments with some shell having been replaced by lustrous translucent brown sparry calcite. The cortex is dark brown and ranges from very thin to 3–5 mm thick and chalky.

Texture: The medium-grained matrix coupled with the sparry calcite pockets make this a difficult material to work.

Size Range: No information.

Type Locality: The type definition is based on a single nodule, suggesting that the type is not an abundant element of the Cowhouse Creek bedload. It is found in a gravel bar in the active channel of Cowhouse Creek, immediately adjacent to the western edge of Fort Hood (Quad 6/61).

TYPE 21: COWHOUSE LIGHT GRAY (CLG)

Overall Appearance: Cowhouse Light Gray chert is a light gray to yellowish gray color with a yellowish tint dominant immediately below the cortex. It has very faint light bluish to white inclusions throughout the matrix. Some lustrous quartzite pockets are also evident. The dark brown cortex ranges from very thin to 3–5 mm thick and chalky.

Texture: CLG has a medium-grained texture and a dull appearance.

Size Range: No information.

Type Locality: CLG is found in a gravel bar in the active channel of Cowhouse Creek, adjacent to the western edge of Fort Hood.

TYPE 22: COWHOUSE MOTTLED WITH FLECKS (CMF)

Overall Appearance: The matrix color ranges from light gray to brownish gray with moderately dark gray pockets and nodule interiors. The change in color tends to parallel the cortex. Some mottling of the brownish gray and dark gray colors occurs at the juncture of the two. Yellowish brown color dominates immediately below the cortex. Perhaps the most diagnostic attribute of this chert is the presence of numerous small (1–3 mm) round to irregular-shaped white to light gray flecks that are usually more concentrated near the exterior of the nodule and more coarse grained than the surrounding matrix. Some flakes removed from near the outer surface of the nodules can resemble Heiner Lake Tan (HLT) in appearance except when more heavily speckled than HLT. The cortex is yellowish brown to dark brown and usually thin, with the chalky cortex not reaching thicknesses greater than 2 to 3 mm.

Texture: Both brownish gray and dark gray portions of the matrix are fine grained with flecked inclusions ranging from medium to coarse grained.

Size Range: No information.

Type Locality: CMF is found in a gravel bar in the active channel of Cowhouse Creek, immediately adjacent to the western edge of Fort Hood (Quad 6/61).

TYPE 23: COWHOUSE BANDED AND MOTTLED (CBM)

Overall Appearance: Cowhouse Banded and Mottled is a two-tone chert dominated by a light and dark gray matrix. These shades of gray are not bedded throughout the nodules but might occur either near the nodule's exterior or interior. Some banding of light and dark gray tones can be seen in both the light and dark gray matrix, respectively, and at their junction. Small

(less than 5 mm) light blue and whitish inclusions are common, while reddish brown specks are scarce. A yellowish brown band of chalky material occurs immediately below the cortex. Alternate banding of light and dark brown colors can sometimes be seen here as well. The cortex of CBM ranges from very thin and dark grayish brown to a somewhat thicker (2–3 mm), chalkier cortex lighter brown in color.

The chert is very similar in appearance to Cowhouse Two Tone (CTT) but exhibits banding that is not present in the nodules used to characterize CTT. CBM has a grayer tone than the more brownish gray matrix of CTT.

Texture: Both light and dark gray portions of the matrix are fine grained. The chalky exterior of the nodules is medium to coarse grained.

Size Range: No information.

Type Locality: CBM is found in a gravel bar in the active channel of Cowhouse Creek, immediately adjacent to the western edge of Fort Hood (Quad 6/61).

TYPE 24: COWHOUSE FOSSILIFEROUS LIGHT BROWN (CFLB)

Overall Appearance: The matrix ranges from light bluish gray to light brownish (yellowish) gray and consists primarily of shell fragments replaced by chalcedony. Yellowish veins extend throughout the material. Immediately below the cortex the material has a tan to brownish gray color, while within the interior of the nodules the matrix takes on a distinctly bluish gray color. The cortex is brown and thin. This chert is somewhat reminiscent of Texas Novaculite; however, the individual constituent shell fragments are much more numerous and more clearly identifiable in CFLB.

Texture: The texture ranges from medium to fine grained, although most specimens have a medium-grained texture derived from the original sediments.

Size Range: No information.

Type Locality: CFLB is located in channel gravels from Cowhouse Creek near the west edge of Fort Hood (Quad 6/61).

TYPE 25: COWHOUSE BROWN FLECKED (CBF)

Overall Appearance: The matrix of CBF has a light brownish gray color with occasional diffuse-edged, reddish brown splotches. The most diagnostic attribute is the presence of numerous small (1–2 mm), spherical to tubular white inclusions which are distributed randomly throughout the material. Occasional light bluish inclusions are also present in the matrix, as are scarce medium-grained quartz inclusions. The cortex is yellowish brown and ranges from thin to chalky. The chalky portion that penetrates the material is white and may be as thick as 3 mm.

Texture: CBF is fine grained and somewhat reminiscent of Fort Hood Yellow. The inclusions are small and do not appear to diminish raw material texture. In its original state the material has a faint luster probably derived from its fine texture.

Size Range: No information.

Type Locality: CBF is found in channel gravels from Cowhouse Creek, adjacent to the western edge of Fort Hood (Quad 6/61).

TYPE 26: COWHOUSE STREAKED (CS)

Overall Appearance: The base matrix of this chert is pale gray to bluish gray with dark gray, pale brown, and dark brown streaks often formed by varying proportions of very small dark brown flecks. A few light gray to bluish coarse-grained inclusions are also present in the matrix. The material has a yellowish brown appearance immediately below the cortex. The cortex is yellowish brown and ranges from thin (1 mm) to somewhat thicker (2–3 mm) and chalky.

Texture: CS has medium- to fine-grained texture with a dull luster.

Size Range: No information.

Type Locality: CS is found in a gravel bar in the active channel of Cowhouse Creek, adjacent to the western edge of Fort Hood (Quad 6/61).

TYPE 27: COWHOUSE NOVACULITE (CN)

Overall Appearance: This chert ranges from

light gray to light bluish gray, with light brownish gray often found in the same nodule. It often contains small (1 mm) dark brown to black specks throughout the matrix. The cortex is very light brown to light gray and ranges from thin (1 mm) to slightly thicker (2–3 mm) and chalky. The color of the matrix is similar to Texas Novaculite (TN); however, CN is significantly coarser grained than TN.

Texture: Medium to coarse grained and dull.

Size Range: No information.

Type Locality: CN is found in a gravel bar in the active channel of Cowhouse Creek, adjacent to the western edge of Fort Hood (Quad 6/61).

TYPE 28: TABLE ROCK FLAT (TRF)

Overall Appearance: The most common color in the matrix of TRF is light gray which grades into pale brown, yellowish brown, and even brownish yellow near the corticate exterior of the nodule. Gray to dark gray veins are often found near the exterior of some nodules. A few coarse-grained gray to dark gray mottles with abrupt edges occur near the centers of nodules. The cortex ranges from light yellowish brown to white and from relatively thin (1–2 mm) to thicker (3–5 mm) and chalky.

Small pieces of this material are similar to both Heiner Lake Tan (HLT) and Cowhouse Mottled with Flecks (CMF). In particular, portions of the base matrix where inclusions are scarce have the same color range and texture as these two other chert types. However, the chalky cortex of HLT is reddish orange compared with the light yellowish brown to almost white cortex of TRF. Sufficiently large flakes of CMF can be separated from TRF specimens due to the numerous small to medium-sized white to very light gray flecks present in CMF but absent in TRF.

Texture: The majority of this chert type is medium to fine grained, but there is variation even within the same nodule, with exterior portions being coarse grained while the nodule's interior is fine grained.

Size Range: The few specimens collected by Abbott and Trierweiler (1995b:I-12) were judged almost too small to reduce effectively.

Type Locality: TRF is located in the bedload of Table Rock Creek adjacent to where it enters Fort Hood (Quad 3/55). Abbott and Trierweiler (1995b:I-12) state that it was the only chert observed in the bedload of the creek, comprising less than 1 percent of chert in the deposits.